

US 2/SR 204/20th Street SE Interchange Justification Report

FINAL

04/2018

 Washington State
Department of Transportation
15700 Dayton Avenue N
Shoreline, WA 98133-9710

Submitted and Prepared by:

PARSONS

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US 2/SR 204/20th Street SE Interchange Justification Report

Agreement No. Y-11600

FINAL

April 2018

The US 2/SR 204/20th Street SE Interchange Justification Report (IJR) is an effort between the Washington State Department of Transportation (WSDOT), and Parsons Transportation Group, Inc. To conduct this project, WSDOT contracted with:

Parsons Transportation Group, Inc.

600 University Street
Suite 700
Seattle, WA 98101

In association with:

Parametrix
Fehr & Peers
PRR

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INTERCHANGE JUSTIFICATION REPORT

US 2/SR 204/20th Street SE Interchange

This Interchange Justification Report has been prepared under my direct supervision, in accordance with Chapter 18.43 RCW and appropriate Washington State Department of Transportation manuals.

IJR Engineer



EDGES 11/6/2018

By: Rick Chapman P.E.
Project Engineer

Date: 6/15/2018

Traffic Analysis Engineer



By: Chris Reel P.E.
Traffic Analysis Engineer

Date: 6/15/18

Concurrence -
Region Traffic Engineer

By: M. Corino P.E.

Date: 6/21/2018

Concurrence -
~~Project Development Engineer~~
ENGINEERING MANAGER

By: [Signature] P.E.

Date: 6/25/18

Concurrence -
Environmental Manager

By: [Signature]

Date: 06/19/2018

WSDOT Approval -
Development Services and Access Manager

N/A

By: _____ P.E.

Date: _____

WSDOT Approval -
Assistant State Design Engineer

By: Frank Moore P.E.

Date: 6-26-18

FHWA Approval -
FHWA Safety and Design Engineer

N/A

By: _____

Date: _____

STAKEHOLDER CONCURRENCE

The undersigned parties, including all members of the support team from WSDOT and the Local Agencies, concur with this US 2 / SR 204 / 20th Street SE Interchange Justification Report.

WSDOT NW Region



Signature

Engineering Manager

Title

6/14/18

Date

Snohomish County Representative



Signature

SNOHOMISH COUNTY PUBLIC WORKS DIRECTOR

Title

6/13/18

Date

Community Transit Representative



Signature

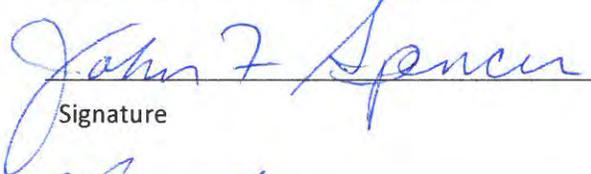
PLANNING MANAGER

Title

6-14-2018

Date

City of Lake Stevens Representative



Signature

Mayor

Title

6/14/2018

Date

City of Everett Representative



Signature

City Engineer

Title

6-13-2018

Date

City of Marysville Representative



Signature

City Engineer

Title

6/13/18

Date

WSDOT
US 2/SR 204/20th Street SE Interchange Justification Report

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GLOSSARY

Acronym	Term		
AADT	Annual Average Daily Traffic	MOE	Measure of Effectiveness
ATM	Active Traffic Management	MUTCD	Manual for Uniform Traffic Control Devices
DTA	Dynamic Traffic Assignment	NB	Northbound
EA	Environmental Assessment	NEPA	National Environmental Policy Act
EB	Eastbound	PPA	Preliminary Preferred Alternative
ECS	Environmental Classification Summary	PPHPL	People per hour per land
EIS	Environmental Impact Study	PSRC	Puget Sound Regional Council
EMME	Travel demand modeling software	ROW	right-of-way
FHWA	Federal Highway Administration	SB	Southbound
GP	general purpose	SEPA	State Environmental Policy Act
GIS	Geographic Information System	TSMO	Transportation Systems Management and Operations
HOV	High Occupancy Vehicle (assumed 2+ occupants for the purpose of this report)	Vissim	Verkehr In-Stadten Simulationsmodell (industry standard multimodal traffic flow simulation software)
HSM	Highway Safety Manual	VPH	Vehicles per hour
HSR	Hard Shoulder Running lane	VPHPL	Vehicles per hour per lane
HSS	Highway of Statewide Significance	VPLPM	Vehicles per lane per mile
IJR	Interchange Justification Report	WB	Westbound
ITS	Intelligent Transportation Systems	WSDOT	Washington State Department of Transportation
ISATe	Enhanced Interchange Safety Analysis Tool		
LOS	Level of Service		

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EXECUTIVE SUMMARY

INTRODUCTION

This interchange justification report (IJR) provides a summary of the work that was completed to arrive at a set of design recommendations for improving conditions at the interchange of the US 2, SR 204, and 20th Street SE (hereafter referred to as “the study interchange”) at the westerly limits of the City of Lake Stevens, Washington. The project was initiated by the 2016 Washington State Legislative Session in an effort to evaluate the need for improvements to the interchange and immediately surrounding highway system to improve traffic conditions and mobility for people and freight in the project area. Summaries of the analysis of current and future needs in this location, existing environmental conditions, a preliminary recommended improvement plan, and additional system considerations are included in this report. This IJR study focuses on modifications to the US 2/SR 204/20th Street SE interchange using assumptions about the connecting highway and local street corridors that are consistent with adopted state, regional and local long-range plans. The assumed future designs and conditions of the connecting highways or local roadways were utilized to determine forward compatibility with recommended interchange designs under this project and to support potential phasing considerations of same.

This report is formatted to address the eight policy points outlined in the FHWA policy for approving new or revised access to the Interstate System, as described in Federal Register document E9-20679. These policy points are reiterated in Chapter 550 of the WSDOT Design Manual, with additional prompts and clarification of WSDOT requirements included. Each policy point is addressed in a single chapter of this IJR, and the WSDOT and FHWA requirements are detailed at the heading of each chapter. The chapters are outlined to address all questions in the FHWA Interstate Access Policy Promptlist.

BACKGROUND

In the 2016 legislative session, the legislature provided funding (as part of ESHB 2524.SL) to develop an IJR for the US 2 trestle, covering the US 2/SR 204/20th Street SE interchange at the eastern end of the westbound (WB) structure.

Prior to that, the State, in partnership with Snohomish County; the cities of Everett, Marysville, Lake Stevens, Snohomish, and Monroe; and Community Transit developed a corridor planning study for US 2 between Everett Port/Naval Station and SR 9. The plan identified that the future replacement of the WB trestle is driven by the useful life of the existing structure, and that continued maintenance of the trestle will extend the useful life of the WB trestle to approximately 2045.

However, given the community interest in addressing significant lead time to replace the trestle, and the current safety- and congestion-related operational issues during peak hours at the study interchange, this IJR built on work completed under the previous corridor study by looking at alternate improvement concepts that can be phased and incorporated into the longer term replacement plan while providing near-term operational and safety benefits.

After the initiation of the US 2/SR 204/20th Street SE IJR study, the legislature amended SB 5096 to include section 2.18, which authorized the State Department of Transportation (DOT) to develop a cost estimate

for the replacement of the WB portion of the US 2 trestle.¹ The cost estimate project is independent of this IJR and is intended to evaluate a full array of potential financing options. In addition to a fuel tax funding option, the US 2 Westbound Trestle Replacement Funding and Finance Team evaluated the potential for funding the trestle replacement using toll-generated revenue as part of a public-private partnership (P3) or State-backed bonds tolling scenario. Information about the possible changes to traffic are included as information throughout the document. If the project is determined to be funded using tolls, additional analysis will be required to reflect future traffic operations and congestion.

LOCATION

Figure ES-1 shows the project location. The on-ramps from SR 204 and 20th Street SE onto US 2 WB initially merge with one another and subsequently join US 2 WB approximately 2.2 miles east of the I-5/US 2 interchange. The study interchange is the last major entrance to US 2 WB before US 2 merges with I-5 northbound (NB) and southbound (SB) and with local streets in the city of Everett. US 2 is a T2 freight corridor and highway of statewide significance (HSS), being a primary connection for cross-state traffic paralleling I-90. It also serves regional traffic between eastern Snohomish County and the cities of Everett and Marysville. Regional communities directly served by US 2 WB include the cities of Lake Stevens, Snohomish, Monroe, and Sultan. SR 204 is a T3 freight corridor² and connection for traffic headed south on SR 9, another HSS, to US 2 WB.³ Project limits for the study include the following:

- US 2: I-5 to SR 9
- I-5: 41st Street to E Marine View Drive
- SR 204: US 2 to Ninth Street SE/10th Street SE
- 20th Street SE: US 2 to Cavalero Road

CONTEXT

The study interchange is situated between the City of Lake Stevens and Ebey Island, an area that encompasses a combination of wetlands, farm land, and single-family homes. The small community on Ebey Island has access to the island only via ramp connections with US 2. Immediately east of the interchange is the City of Lake Stevens, which comprises residential and business areas. Portions of SR 204 and 20th Street SE intersect underneath the elevated interchange.

The region surrounding the study interchange has experienced significant growth over the last two decades and is projected to continue on a similar trajectory. Population is forecast to increase 30 percent in Snohomish County by the planning horizon year, 2040. A good percentage of the population increase is expected to occur in the area east of Ebey Island. Major employment centers remain in Everett and Seattle, west of Ebey Island. The City of Lake Stevens is currently pursuing plans for an HOV lane along 20th Street SE that could be implemented as an interim improvement or be maintained long term. The HOV lane configuration was considered in the design element of this study and could be accommodated if it were to be implemented by the City.

Sound Transit's traveler demand projections have been exceeded due to this rapid regional growth, and both Sound Transit and Community Transit are developing future plans to facilitate movement of these

travelers. The study interchange is — and will continue to be — the access point for Community Transit routes that serve travelers between eastern Snohomish County and downtown Everett, Boeing Everett, and the City of Seattle. Four bus routes travel through the interchange to cross the US 2 trestle: two routes originate on 20th Street SE and two routes originate on US 2 east of the interchange. No high-occupancy vehicle (HOV) or transit facilities exist along US 2, and travel times for all commuters crossing the US 2 trestle westbound in the morning are unreliable.

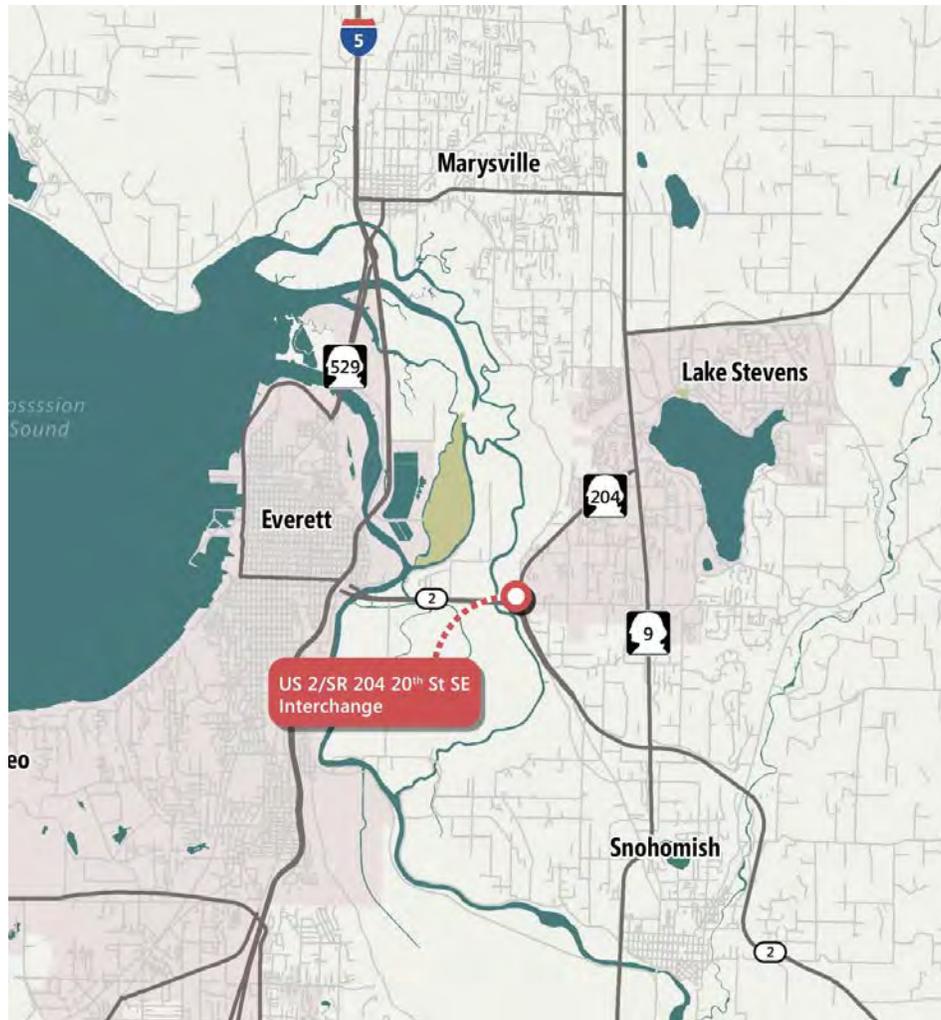


Figure ES-1. Project Location

NEED SUMMARY

The study interchange is a critical confluence of three primary corridors that serves east and west Snohomish County: US 2, SR 204, and 20th Street SE. The study interchange is used by regional commuter traffic, freight movement, access to the natural areas of Washington State, shopping, and local entertainment. The study interchange is also a critical point in the linkage between I-5 and SR 9 for traffic to bypass severe congestion on either of the two primary north south corridors through Snohomish

County. Community transit also uses the study interchange to provide a multimodal travel choice for people living and working on either side of the US 2 trestle.

Congestion at the study interchange during the morning peak commute hours greatly affects the travel time reliability and delay of all users. This congestion extends from the study interchange to at least a mile upstream in all directions. Traffic operations in the study interchange present a safety concern, as noted by the collision frequency in that location. Demand for travel along this route has increased steadily over the last 15+ years and is expected to continue to increase as the local jurisdictions continue to increase their available employment opportunities resulting in population growth. There is also a need to improve the non-motorized connectivity through the study interchange so that people can safely choose different modes of travel.

There is a current need to improve conditions within the US 2/SR 204/20th Street SE interchange that would improve safety, travel times and reliability for all modes of traffic.

KEY FINDINGS

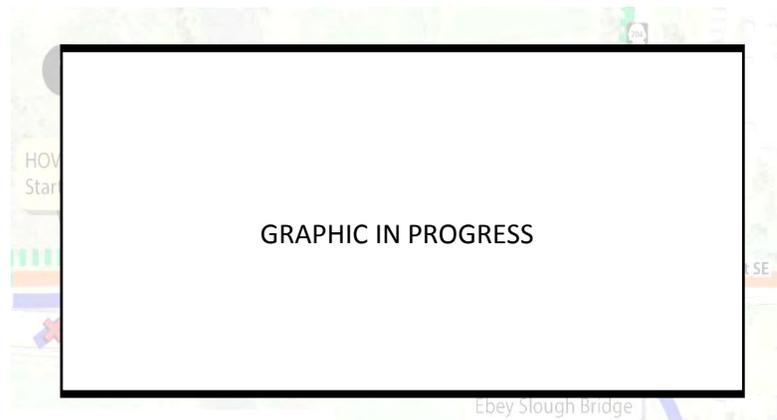
This section is intended to highlight key points about future conditions that supported the IJR Support Team’s decisions about the preliminary preferred alternative. The alternative is considered preliminary until a full environmental evaluation has been completed. During the environmental process the purpose and need will be confirmed, concepts reviewed, and possibly new opportunities explored that will help to avoid, minimize, and mitigate environmental impacts.

Year 2040 Traffic Demand

- Future year 2040 AM peak hour westbound travel demand across the trestle with no new interchange (No Build) but including a new three-lane US 2 westbound trestle (two general-purpose [GP] lanes and one HOV lane) increases by 45 percent compared to today.
- About half of the traffic growth would travel to downtown Everett and the rest to I-5.
- If a fourth lane were added to the US 2 WB trestle (three GP and one HOV) about 6 percent more growth would be expected in the year 2040 compared to No Build.
- Most of the additional growth with a four-lane US 2 WB trestle would be traffic destined for I-5.

No-Build (2040)—assumes 2 GP lanes and 1 HOV lane on the Trestle

- Severe congestion east of the study interchange.
- Over 7.5 miles in total system congestion.
- Congestion starts at SR 204/20th Street SE merge.
- Because of upstream congestion and added capacity on the US 2 trestle,



traffic operates nearly free-flow; limited benefit for HOV.

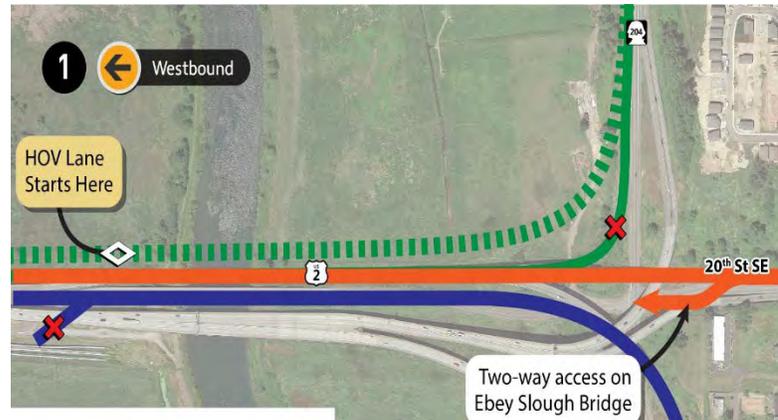
- Available capacity in the HOV lane.

Safety and Reliability

- Improved interchange design, sight distance, and shoulder width will improve the corridor safety and reliability for all Build concepts that were evaluated.

Concept 1 (compared to No-Build)

- Congestion starts on US 2 trestle where HOV lane originates.
- Over 4.8 miles in total system congestion.
- US 2/SR 204/20th Street SE interchange improvement allows about 575 more vehicles to reach the I-5 interchange during the peak hour.



- Travel times for 20th Street SE and SR 204 traffic decrease by 15 to 20 minutes.
- Travel times for US 2 traffic increase by nearly 10 minutes.
- HOV lane saves an additional 2 minutes per HOV vehicle compared to GP traffic in the GP lanes.
- Available capacity in the HOV lane.

Concept 4 (compared to No-Build)

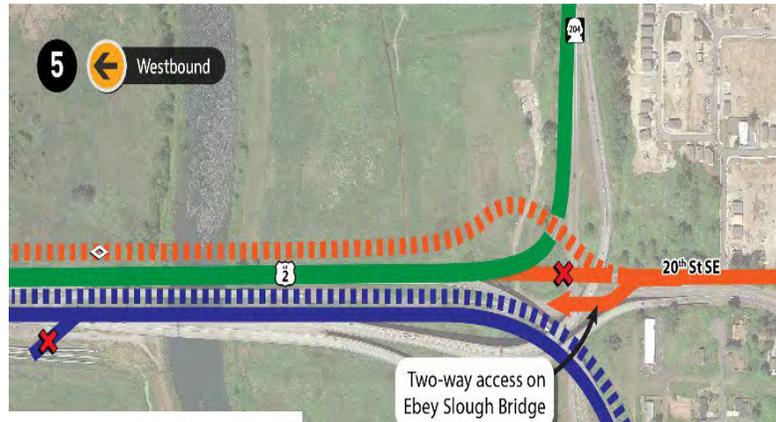
- Congestion starts at the I-5 interchange area.
- Over 3.3 miles of system congestion shows improvement over No Build and Concept 1.



- US 2/SR 204/20th Street SE interchange improvement allows about 1,150 more vehicles to reach the I-5 interchange during the peak hour than No Build.
- Travel times for 20th Street SE and SR 204 traffic decrease by 10 to 15 minutes.
- No significant travel time difference for US 2 traffic.
- HOV lane saves additional 3 minutes per HOV vehicle in the HOV lane compared to GP traffic in the GP lanes.
- Available capacity in the HOV lane.

Concept 5 (compared to No-Build)

- Congestion starts at the I-5 interchange area.
- Over 3.3 miles of system congestion shows improvement over No-Build and Concept 1.
- US 2/SR 204/20th Street SE interchange improvement allows about 1,150 more vehicles to reach the I-5 interchange during the peak hour than No-Build.
- Travel times for 20th Street SE and SR 204 traffic decrease by 10 to 15 minutes.
- No significant travel time difference for US 2 traffic.
- HOV lane saves an additional 3 minutes per HOV vehicle in the HOV lane compared to GP traffic in the GP lanes.
- Available capacity in the HOV lane.



PROCESS

Figure ES-2 highlights the process that was used by the IJR Support Team to develop the project needs, develop and screen concepts, evaluate the three most reasonable alternatives using more detailed technical analysis, and select a preliminary preferred alternative. The bottom of the diagram indicates when the IJR Support Team meetings occurred to move the process forward.

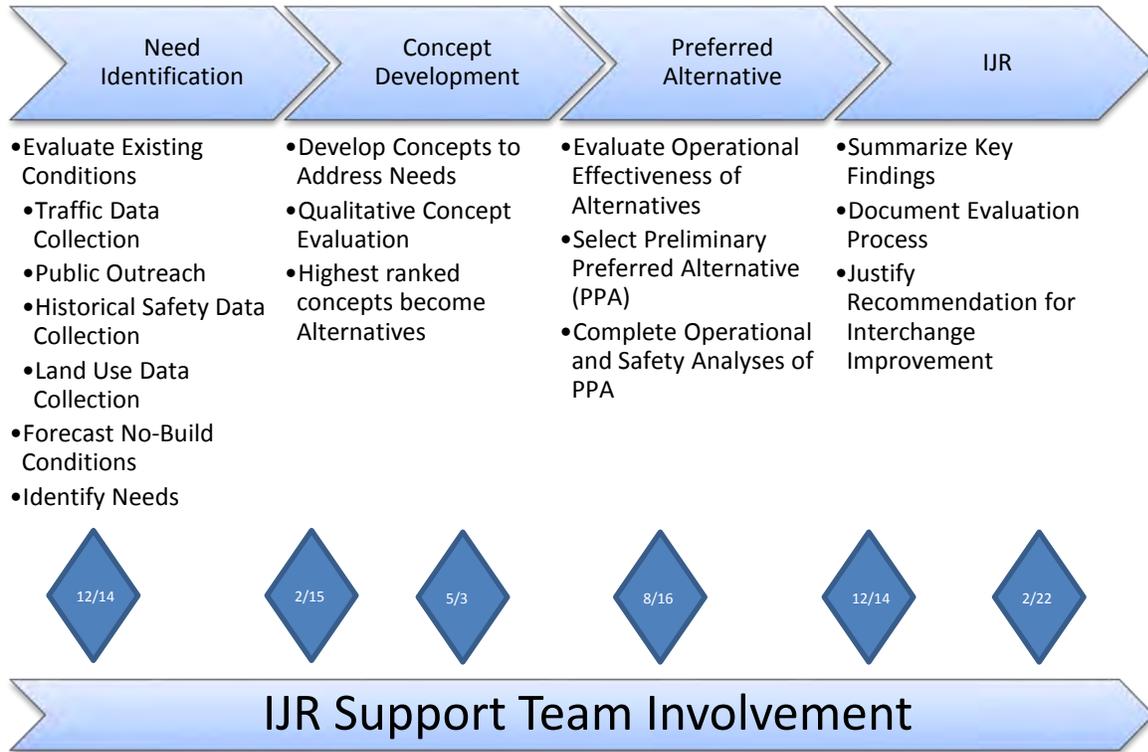


Figure ES-2. IJR Development Process

RECOMMENDED ACTION

The preliminary preferred alternative includes significant changes to the study interchange. The design provides necessary flexibility to connect with either a future three or four lane US 2 westbound trestle. For this study, the analysis assumed the US 2 trestle would be able to accommodate a four-lane operation that would have one HOV and three GP lanes. The study interchange would connect to the westbound US 2 trestle with one lane from SR 204, one lane from 20th Street SE, and two lanes from US 2. Access to Ebey Island from the existing westbound off-ramp to 20th Street SE (lower roadway) would be relocated to the intersection of SR 204/20th Street SE. This was assumed to require construction of a new crossing over the Ebey Slough and accommodate two-way vehicular access as well as bicycles and pedestrians. During the next phase of the project this assumption could be re-evaluated as part of the practical design process.



Local and state agencies will continue to consider, study, and evaluate active traffic management strategies for the future US 2 trestle. Lane management strategies are anticipated to be integrated with the preliminary preferred alternative selection.

The study interchange could be constructed and open for operation prior to the completion of a future westbound US 2 trestle. The new study interchange would provide safety benefits by improving the ramp tapers, removing a weave condition, and providing additional sight distance on the ramp curvatures. The interchange could be built using various construction sequencing methods that would provide transportation and safety benefit and connect with the existing trestle.

A separate NEPA/SEPA process including alternatives analysis, environmental evaluation and engineering design would be required to select the final lane configuration for the US 2 trestle, which itself is dependent on any future plan by WSDOT for revisions to I-5 connections, and by the city of Everett for revisions to their local street network design and operations.

Analysis conducted for this IJR highlighted the need for further evaluation of the connection to I-5 and downtown Everett that would be integral to future construction of a four-lane US 2 westbound trestle. The future study would also have to consider how it would be forward-compatible with a future I-5 corridor configuration. This IJR study was conducted assuming the existing I-5/US 2 interchange configuration; however, if improvements to the I 5/US 2 interchange are pursued and result in improved access from I-5 or Everett to the eastbound US 2 trestle, then additional study would be required at the US 2/SR 204/20th Street SE interchange to investigate its ability to adequately accommodate higher eastbound traffic volumes.

Additional evaluation of the connectivity between the US 2 corridor and the downtown Everett transit station is recommended, as more people may shuttle between east Snohomish County and down town Everett to use Sound Transit rail for access to other areas within the region.

SCHEDULE AND FUNDING

Funding for this IJR was provided through ESHB 2524.SL. This includes the associated data collection, traffic operational and safety analyses, preliminary concept engineering and sketch-level design work, public outreach, and preliminary environmental evaluation. This document will be provided for legislative review when it is completed in June 2018. It will help to inform decision-makers regarding the allocation of future funding for environmental planning, engineering design, and construction of the selected alternative.

After the funding has been procured, the design and environmental planning will commence with an expected construction duration of 3 to 6 years, assuming that the project is fully funded. If the project is funded in phases, the construction duration could be longer. Additional construction duration certainty can be gained as the project moves into the next phase of environmental documentation, design, and field work.

¹“US 2 Westbound Trestle Funding and Finance Study” (Bill ESB 5096 (2017-18), 2018)

<http://app.leg.wa.gov/ReportsToTheLegislature/Home/>

² WSDOT Freight and Goods Map, *WSDOT Online Map Center*, <http://wsdot.maps.arcgis.com/home/index.html>

³WSDOT Highways of Statewide Significance Map, *WSDOT Online Map Center*

POLICY POINT 1. NEED FOR THE ACCESS POINT REVISION

What are the current and projected needs? Why are the existing access points and the existing or improved local system unable to meet the proposal needs? Is the anticipated demand short or long trip?

The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).

1.1 NEED AND PURPOSE

This section describes the need for improvement, the purpose of documenting this need in an interchange justification report (IJR), and goals to be met by the improvements. Figure 1-1 is provided for reference of the study interchange location.

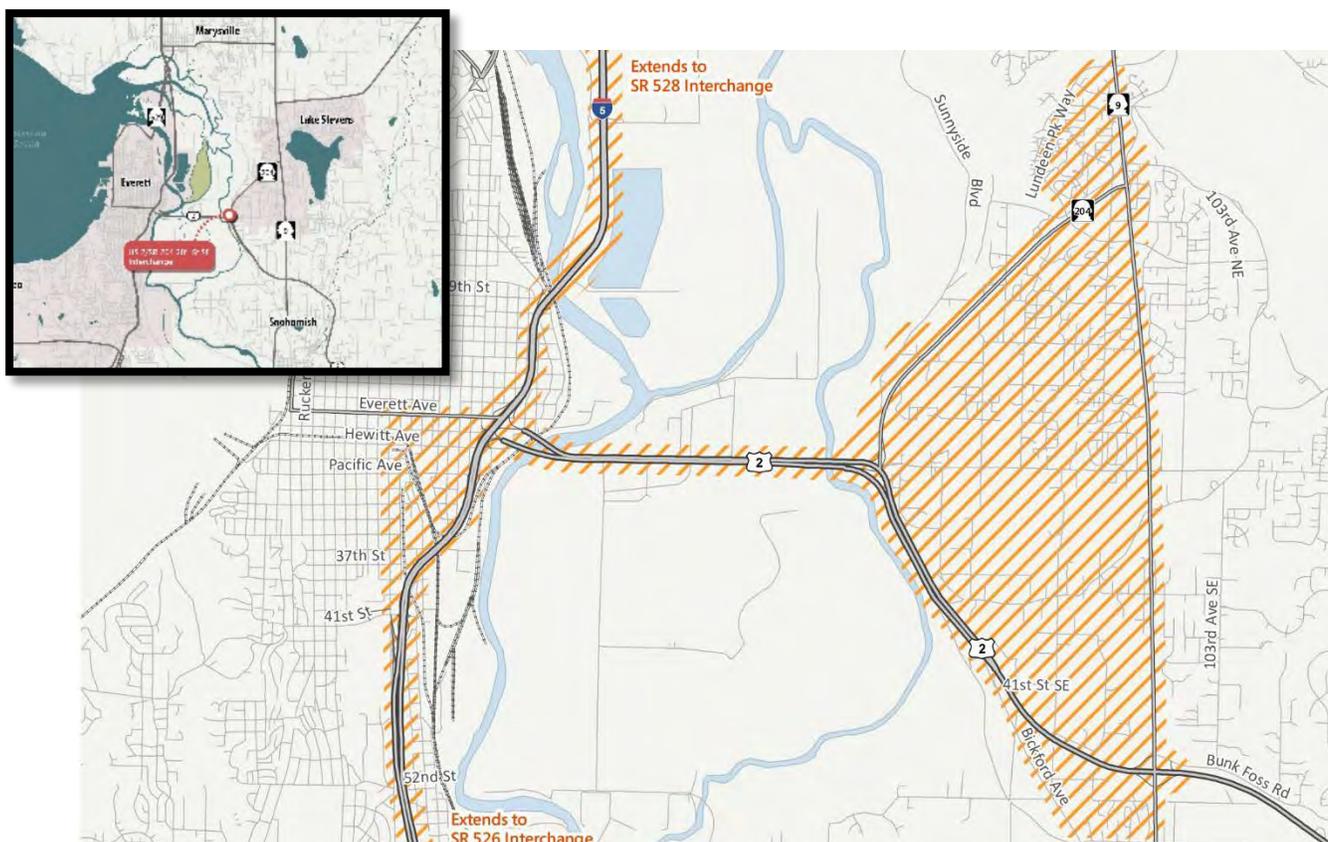


Figure 1-1. Study Area

1.1.1 Need Identification

Needs for the study interchange improvement are based largely on existing traffic operations issues and safety. Without modifications to the study interchange, traffic congestion and safety would degrade further as local and regional growth continues throughout Snohomish County. This section discusses the needs for the study interchange based on stakeholder input, operational analysis, and safety evaluations.

Stakeholder Interviews

To identify the deficiencies that exist today and the needs that must be met by the future transportation network, key stakeholders were identified to represent the interests of the primary users of this transportation facility. These stakeholders include surrounding municipalities, public transportation, and bicycle and trucking interest groups.

Several key themes were consistent throughout the interviews:

- The current interchange operations are poor during peak travel times, and stakeholders are supportive of a study to identify near-term improvements to relieve congestion.
- Top-priority improvements were varied for stakeholders, but all could agree that the near-term improvements must not adversely impact local streets and communities or hinder potential for long-term improvements; i.e., the recommended improvements should consider and complement regional and future transportation planning.
- Potential future improvements that reduce travel time and increase speed and reliability are key indicators that the study is successful.

In addition to individually interviewed stakeholders, a public survey was held to solicit input directly from the general population regarding the issues that exist at the study interchange. More than 2,700 surveys were collected, of which the majority represented daily users of the interchange.

- 73 percent reported that their travel time through this interchange has increased by more than five minutes in the last five years.
- 77 percent report traveling as a solitary vehicle occupant through the interchange.
- 56 percent avoid using the interchange to access US 2 at least some of the time, instead using an alternate route to WB US 2.

This stakeholder input was the starting point for clarifying the needs that must be addressed and influenced the official need statement (included in this section). For further detail on stakeholder interviews and the public survey response, see Appendices B and C.

Analysis

Data was collected in November and December 2016 to perform an analysis of present-day demand, existing traffic operations, and historical collision trends. The information was also used to forecast future conditions, allowing analysis of future needs in the existing transportation infrastructure.

Demand

The Snohomish County Urban Growth Area Map⁴ illustrates that the US 2 corridor connects urban growth areas of the cities of Gold Bar, Sultan, Monroe, Marysville, Snohomish, Lake Stevens, and Everett (traveling from east to west). Of these urban growth areas, Everett is the largest employment center; it is home to Boeing, Providence Regional Medical Center, and Naval Station Everett in addition to many other public and private employers. Lake Stevens is the second-largest city along the corridor, and serves primarily as a residential area. Table 1-1 summarizes the population and employment centers in Snohomish County.

This table shows that Lake Stevens and Marysville currently serve as bedroom communities for employees of Everett-based businesses. While some of the Marysville-generated trips travel south on I-5 from north of the US 2 corridor, there are many trips from east Marysville travelling south along SR 9 and through the study interchange to access I-5 via the US 2 corridor.

TABLE 1-1. SNOHOMISH COUNTY LAND USE SUMMARY

Area	2016 Baseline ¹		2040 Forecast ²	
	Households	Employment	Households	Employment
Arlington Citywide	6,760	10,918	9,652	21,320
Everett Citywide	42,619	100,817	73,750	163,527
Lake Stevens Citywide	10,361	5,246	15,087	8,087
Marysville Citywide	22,603	15,442	33,811	29,030
Monroe Citywide	5,133	10,530	6,553	12,580
Snohomish Citywide	3,796	6,066	5,723	8,986
All Snohomish County	282,401	311,069	399,309	458,937

1. Data from PSRC model 2015 baseline (with applied growth)

2. Data from PSRC forecasts for 2040

The land use summary explains the strain placed on US 2 at the study interchange. Figure 1-2 illustrates how east- and westbound traffic from the mid-span of the US 2 trestle distributes on either end of the trestle during the morning peak hour. As shown in this figure, the origins of the WB traffic demand on the trestle in the AM peak period are split between SR 204 and 20th St SE, while US 2 carries almost 40 percent of the traffic demand. This points to the significance of the study interchange as an important transportation node. At the west end of the trestle, most of the traffic is heading into downtown Everett or onto I-5 SB (includes traffic going to Boeing). The traffic patterns in the reverse peak direction (EB in the AM peak period) are similar, although a higher proportion of traffic from SB I-5 exit onto US 2 to access destinations farther to the east or southeast in the county. This traffic distribution could be the result of limited crossings between I-5 and SR 9 or US 2 combined with high levels of congestion on the I-5 corridor south of US 2. Comparable traffic patterns occur during the PM peak period and can be found in the Traffic Operational Analysis Technical Memorandum in Appendix D. See Policy Point 3 for vehicle demand figures and analysis.

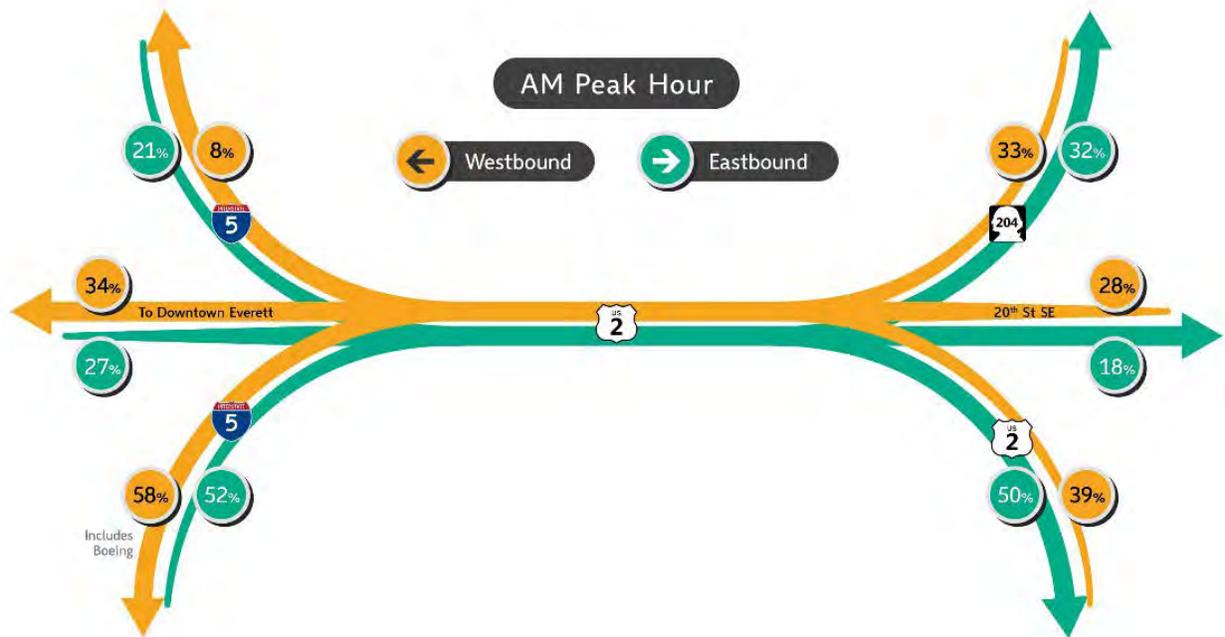


Figure 1-2. Existing Trip Distribution

The heavy demand for trips through the US 2/SR 204/20th Street SE interchange is primarily imposed by travelers driving solo and the lack of convenient and reliable alternative modes to driving solo. This is indicated by the Existing Corridor Data Summary presented in Appendix E as well as input from the general public, whose survey responses indicate that they prefer personal vehicles over transit. The low-density design of land uses in the population areas effectively forces people to choose personal vehicles over transit or high-occupancy vehicles (HOVs) like vanpools, including travel time flexibility and locations accessible via transit. A summary of public survey responses is available in Appendix C.

Vehicle demand on US 2 is measured with a permanent traffic recorder located east of I-5 (within 2 miles of the study interchange). The volumes shown in Figure 1-3 were recorded at this location and published in the WSDOT Annual Traffic Report. With obvious outliers due to the economic recession of 2007-08, the demand served on this highway segment has increased at a steady rate since placement of the traffic recorder. This corresponds with changes in land use throughout the county; it can be expected that demand will continue to increase per land-use forecasts that predict continued growth in eastern Snohomish County.

As daily demand increases over time, drivers with the flexibility to adjust their travel times will do so to avoid peak congestion. See Appendix C for local survey responses that indicate such behavior.

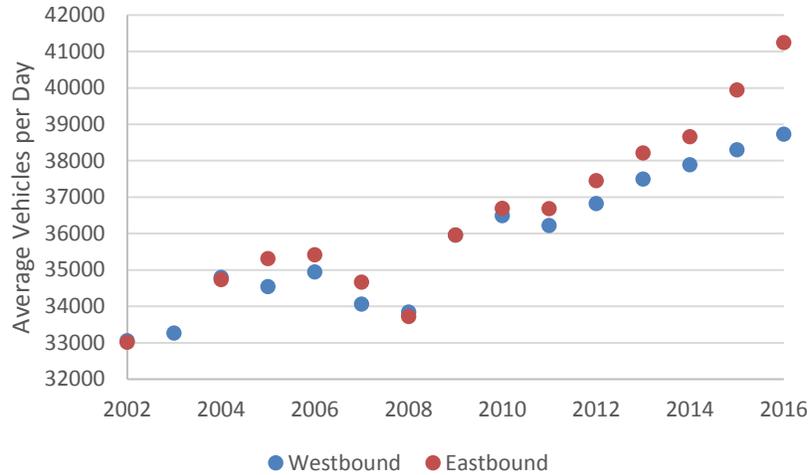


Figure 1-3. AADT on US 2 East of I-5

Traffic Operations

Analyses of the existing and future conditions were conducted to assess the current operations at the study interchange and the effects of future demands on a no-build condition.

Traffic on the WB approach roadways to the study interchange experiences severe congestion during the existing (2016) AM peak hour. This is attributed to the limited capacity for throughput and the high demand attempting to access US 2 WB at the study interchange. The congestion is experienced not only along SR 204 and 20th Street SE as they approach the interchange, but also along the US 2 WB mainline due to the reduction from two lanes to one lane just upstream of the study interchange. Once past the US 2/SR 204/20th Street SE interchange, traffic flow improves a bit across the trestle, slowing again as the vehicles queue upstream of the I-5 on-ramps and the Everett city intersections. Although it is typically expected that the PM peak would show a similar congestion trend along the reverse route, the PM peak hour does not currently bring the same level of congestion along US 2 itself or at the SR 204/20th Street SE interchange. This is due to the EB traffic being constrained on I-5 and at Everett city intersections so they are unable to access US 2 at a rate that would cause heavy congestion. In addition, the EB mainline US 2 has higher capacity due to a third peak-hour use lane.

The forecast analysis for the design year (2040) No-build alternative shows slightly improved operations along the WB trestle compared to existing conditions. The improved condition results from an assumption in the 2040 regional plan that the US 2 Trestle will have 3 WB lanes, with one lane dedicated for use by HOVs only. However, the increased traffic demand upstream of the US 2/SR 204/20th Street SE interchange causes significantly worse congestion along the surface streets, SR 204, and mainline US 2, with backups extending beyond the limits of the study area (see

Figure 1-4 and Figure 1-5). Without any improvement to the study interchange, throughput measured at the interchange remains the same, while demand is expected to increase by almost 30 percent. The future no-build scenario is described in more detail in section 3.3.2.

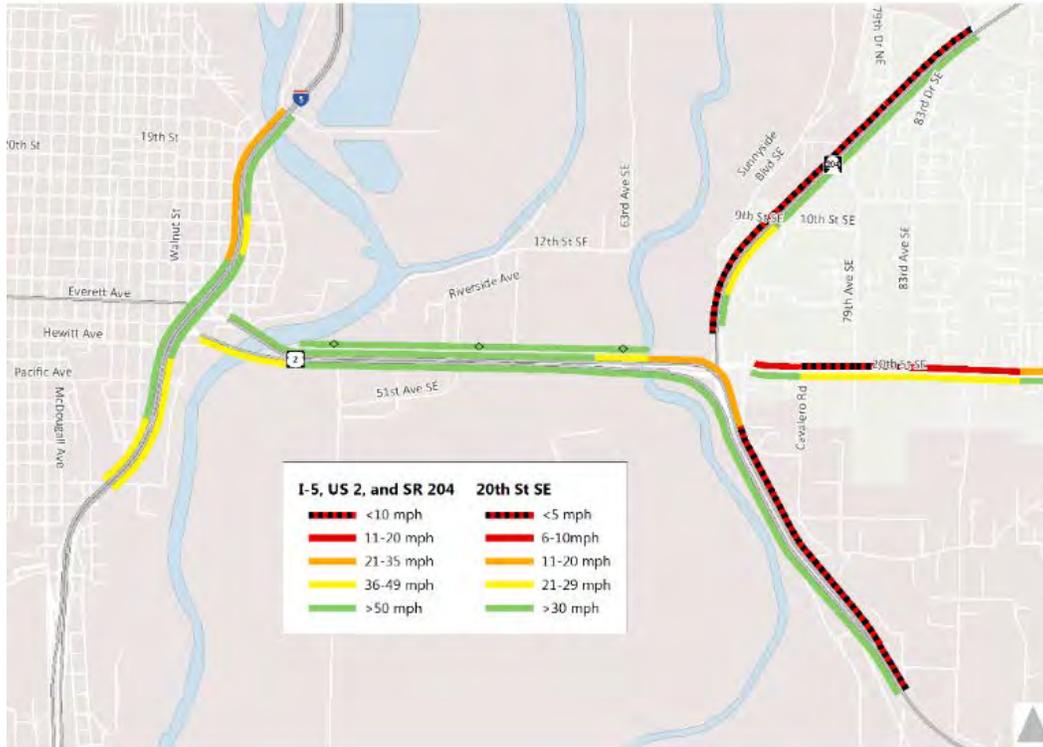


Figure 1-4. Forecast Speeds. No-Build 2040 AM Peak

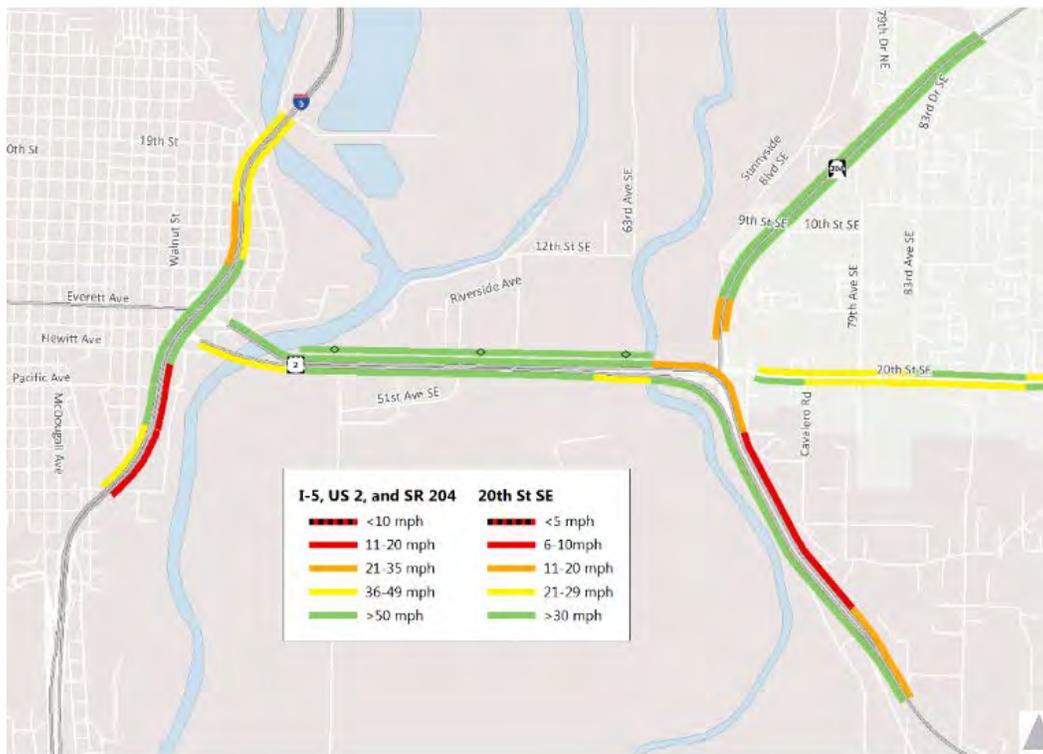


Figure 1-5. Forecast Speeds. No-Build 2040 PM Peak

EB congestion on the US 2 Trestle is not forecast to increase significantly between 2016 and 2040 due to the roadway network constraint at the western I 5/US 2 interchange that connects with downtown Everett and the I-5 corridor. This demand-limiting entrance to the US 2 Trestle ensures that the number of vehicles traveling east will be maintained at a level lower than capacity. The additional travel time experienced by eastbound travelers is attributed to delays on I-5 between Pacific Avenue and the merge onto EB US 2. Further delays are experienced by travelers when they exit EB US 2 at the study interchange.

The operations analysis conducted for this IJR focused on travel speed and travel time to quantify the congestion experienced by travelers in the study area. The results of the speed and travel time forecast are presented in Table 1-2; operations analysis is discussed in more detail in Policy Point 3.

TABLE 1-2. US 2 CORRIDOR TRAVEL TIME

Segment	Direction	2016 Existing		2040 No-Build	
		Travel Time (min) ¹	Speed (mph)	Travel Time (min) ²	Speed (mph)
AM Peak 15 Minutes					
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	13:45	19	32:00	8
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	9:05	25	28:05	8
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:05	30	14:20	17
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	4:55	51	5:05	50
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	4:55	45	5:35	39
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	4:55	55	5:00	53
PM Peak 15 Minutes					
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:00	51	6:20	41
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:00	45	8:15	27
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	4:25	55	12:00	20
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	7:00	36	6:35	39
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	6:50	32	6:30	34
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:15	43	6:20	42
1. Average observed travel time; data collection method is discussed in Appendix A					
2. Predicted data from Vissim					

Safety

Crash data from January 2011 to December 2015 was analyzed for collision-trending throughout the study area. As shown in Figure 1-6, along US 2 WB, the majority of collisions occur in the morning and between the Ebey Island on-ramp and the merge with I-5. Two other locations along this corridor tend to be frequent collision locations: the SR 204/20th St SE merge, and just north of the US 2/Bickford Ave interchange. The congestion experienced as traffic approaches I-5 leads to frequent lane-changing and rear-end collisions. There also tend to be collisions at the US 2/SR 204/20th Street SE interchange location as oncoming traffic enters the highway from SR 204 and 20th Street SE and attempts to merge with

existing lanes. The collisions near the US 2/Bickford Ave interchange occur as vehicles merge and diverge due to the Bickford Avenue on- and off-ramps.

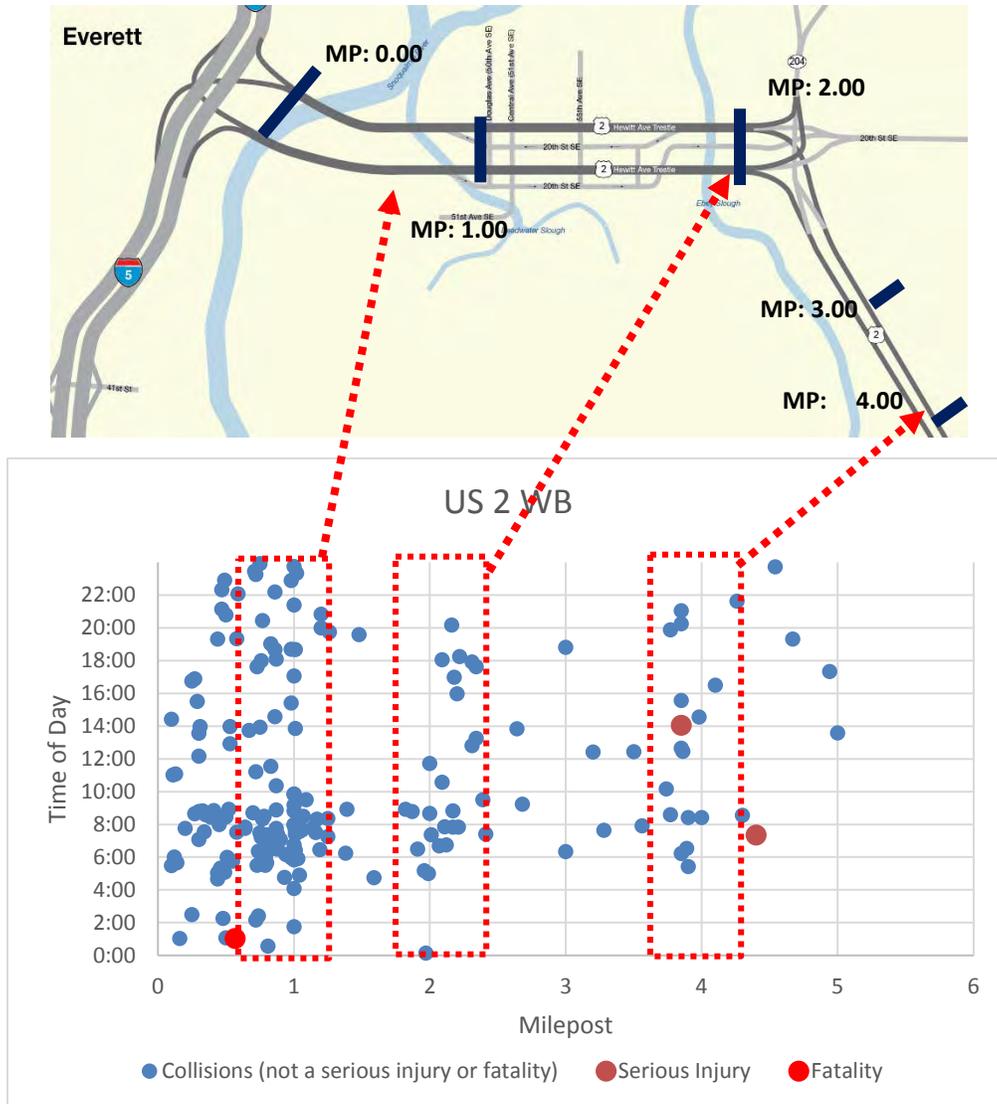


Figure 1-6. Locations of Collisions along US 2

The merge of SR 204 and 20th St SE also sees a very defined pattern of collisions throughout the day. This location has been cited by many concerned travelers as a location of poor visibility for those entering from SR 204, and the difference in speed between those coming from 20th St SE and those coming from SR 204 is enough to create a very uncomfortable merge. Traveler input was acquired during an open house held in October 2016, as well as through the online survey documented in Appendix C. The collision analysis is detailed in Appendix D.

As the IJR study was in progress, the study team was contacted by the Bicycle Center of Snohomish and Silver Lake concerning a bicycling fatality that occurred at the SR 204/20th Street SE intersection. This collision is not reflected in the data presented in Appendix D, since it was reported after the data collection, but the incident demonstrates a need for improvement to the existing non-vehicular network in vicinity of the study interchange.

1.1.2 Need Statement

Current Needs

The US 2 corridor provides a critical connection between eastern and western Snohomish County. People living in eastern Snohomish County travel across Ebey Island using the US 2 trestle to access employment locations in Marysville, Everett, Lynnwood, and even as far south as Seattle. These long trips service major employment centers in the west including Port of Everett, Everett Naval Yard, and Boeing. As land use continues to change in eastern Snohomish County, more and more people will be traveling east for employment and to enjoy the recreational opportunities in the Cascades and Eastern Washington.

Today's WB US 2 trestle traffic demands and travel modes used during the morning commute period exceed the available capacity at the study interchange, resulting in extensive traffic congestion during each morning peak period. This congestion affects all three approaches to the interchange. Congestion on the SR 204 and 20th Street SE corridors extend back for nearly a mile during the peak morning commute. Traffic delays on WB US 2, SR 204 and 20th Street SE result in drivers experiencing travel times nearly double that of free-flow conditions for much of the one hour AM peak commute.

Traffic safety data illustrates a cluster of accidents that occur at the SR 204 and 20th Street SE merge point prior to joining the US 2 corridor. This cluster of accidents occurs evenly throughout the day and appears to be independent of the traffic demand. This is a common indicator of a geometric condition that warrants further attention to reduce the number of crashes. Concerns were expressed about the accessibility for cyclists and pedestrians to travel across Ebey Island.

Community Transit provides regional transit service as well as sponsored vanpools along the corridor. However, the travel experiences for these modes are no different from those commuting solo. Since there are no lanes that provide them any travel advantage anywhere along the corridor today, they are caught in the same congested segments as everyone else.

There is a current need to improve conditions within the US 2/SR 204/20th Street SE interchange that would improve safety, travel times and reliability for all modes. A need for multimodal accessibility was also identified in the interchange area.

Forecast Needs

As population and employment continue to grow in eastern and western Snohomish County, the traffic demand will increase at the US 2/SR 204/20th Street SE interchange. Traffic demand forecasts for various modes of travel, consistent with the travel-demand models of both the Puget Sound Regional Council (PSRC) and Snohomish County, demonstrate that future traffic demand for the westbound US 2 trestle crossing will increase by about 35 percent by the year 2040 morning peak hour. This increase in traffic demand occurs equally on SR 204, 20th Street SE, and US 2 on the east. It is anticipated that as traffic demand grows, so will the duration and severity of congestion.

Current long-range Puget Sound Regional Council (PSRC) plans indicate that the WB US 2 trestle will be reconstructed to add a third HOV lane to the existing two GP lanes of traffic, although the improvements are still in an unprogrammed/candidate status. Development of a US 2/SR 204/20th Street SE interchange that is consistent with the future trestle lane configuration is necessary to ensure improved person mobility and safety on the corridor.

1.1.3 Purpose of Proposal

This report documents the IJR Support Team's process for development and evaluation of various alternatives that can address the existing operational and safety needs of the study interchange. The IJR Study will be complementary to and incorporated into future environmental and design studies necessary to meet the state and federal environmental guidelines that are a precursor to the project delivery.

1.1.4 Project Goals and Objectives

Improvements to the study interchange are proposed with the objective of improving safety, travel time, and reliability for WB traffic originating outside the study area and accessing the WB trestle via the interchange, without adversely affecting through traffic on the highway or other traffic on the local roadway network. Success indicators identified by stakeholders include the following:

- Decreased travel time
- Increased travel-time reliability
- Increased speed
- No ancillary impacts on local streets or interchanges
- Improvements in safety
- Opportunities to improve experience for all modes (especially transit, carpools, and rideshare)

In addition to the list of success indicators, the project team worked to ensure improved access for bicycles and pedestrians was considered for all concepts. In developing and comparing design concepts, selected measures of effectiveness (MOEs) for operational evaluation are shown in Table 1-3. Analysis methods are discussed in Appendix A.

TABLE 1-3. OPERATIONAL IMPROVEMENT MOE AND GOALS

Facility	MOE	Units	Goal (Peak Hour)
Intersections	LOS	A–F	D
	Average vehicle delay	min	Directly related to LOS
	95th-percentile queues	ft	Reduced compared to no-build
Freeway segments	LOS	A-F	D
	Density	VPLPM	Directly related to LOS
	Speed	mph	Directly related to LOS
	Queues	ft	Reduced compared to no-build
Corridor(s)	Average travel time (by mode)	min	Reduced compared to no-build
	Average travel speed	mph	Increased compared to no-build
	Queues	ft	Reduced compared to no-build

MOEs for safety analysis will include the following:

- HSM predicted crash rate – fatal and injury
- HSM predicted crash rate – property damage only

The goal of improvements for safety is to minimize overall crash rate and forecast zero fatal and injury collisions.

1.2 NETWORK USERS

The study interchange serves as an access point for those entering US 2 via the City of Lake Stevens. Over 50-percent of these trips originate in Lake Stevens, while the remainder are through trips originating farther north or east in Snohomish County or from the south traveling along SR 9. Travelers use several modes of transportation: automobiles represent 95 percent of traffic, while buses make up less than 2 percent, and heavy trucks less than 3 percent.

An online survey was conducted of the general public, targeting residents of Lake Stevens and Eastern Snohomish County; this survey provided data regarding travelers’ trips when using the US 2/SR 204/20th Street SE interchange. The primary users of the study interchange are regional commuters traveling from the city of Lake Stevens and residential areas north of Lake Stevens (Marysville and Granite Falls) to Everett and the surrounding area for employment. A significant portion of survey respondents (more than 50 percent) also use the interchange for errands and shopping. The study interchange also provides a route for local traffic to access the lower 20th Street SE roadway and Ebey Island, which accounts for a small proportion of interchange traffic.

Identified stakeholders are the cities of Monroe, Snohomish, Marysville, Lake Stevens and Everett; Snohomish County; and Community Transit. Additional detail regarding the traveler demographics are provided in the Final Survey Summary Report in Appendix C.

1.3 ALTERNATIVES TO REVISING THE INTERCHANGE

This section describes measures that were considered as alternatives to a physically constructed interchange modification. It is intended to address the question of whether, “In lieu of [modifying this interchange], is there any reasonable alternative consisting of improvements to the existing roadway(s) or adjacent access points that could serve the need and purpose?”⁵

1.3.1 Transportation Systems Management and Operations

Transportation Systems Management and Operations (TSMO) measures, as alternatives to physical roadway improvements, can alleviate some of the demand on the roadway network in many situations. Existing TSMO elements include traffic cameras at the study interchange, at the US 2/Bickford Avenue and US 2/SR 9 interchanges, and on the US 2 westbound trestle. Cameras can be used to help travelers view traffic conditions prior to making their trip. In some cases, travelers might choose to delay their time of travel, change their destination, or cancel their trip based on existing traffic conditions. These trip changes are commonly attributed to nonessential trips, or discretionary trips, that could include shopping, visiting friends, or other entertainment. They do not usually include home based-work trips. Commute trip reduction programs are in effect for government employees, and Boeing has subsidies and other incentives for commuters who choose alternative transportation rather than driving alone. The impact of additional TSMO measures is not likely to be significant; 76 percent of travelers responding to the open house survey report already adjust their travel choices to avoid peak traffic congestion (see Appendix C).

In the *US 2: Everett Port /Naval Station to SR 9 Corridor Planning Study*⁶ (US 2 CPS), one concept was evaluated to determine the impact of additional TSMO instead of construction.

“Concept 1 consisted of actions that are relatively low cost and easy to implement. These included Active Traffic Management (ATM) along I-5, running the US 2 EB hard shoulder in both the AM and PM peak periods, transit/HOV bypass lanes on 20th Street on Ebey Island, and HOV/HOT lanes operating along I-5 in 2040.”⁷

Evaluation of this concept revealed that the implementation of mitigation methods exclusively is not sufficient to deal with the operational needs experienced in this corridor.

“The future baseline concept maintained most of the existing geometrics along US 2. With the same configuration as today and increased traffic demands in 2020 and 2040, the problems found in the existing conditions are worse. Congestion during the AM peak period on WB 20th Street SE would also produce queues extending to 91st Avenue.”⁸

This IJR investigated the impact of TSMO measures in conjunction with physical infrastructure improvements. Several TSMO strategies were suggested by stakeholders:

- Use ramp metering for traffic entering WB US 2
- Add signage, wayfinding, and striping for bicycles
- Create transit-only access
- Explore increasing HOV and transit options

- Explore transit reroutes to avoid 20th Street SE, specifically reroute buses to approach WB US 2 from farther south

Ramp Metering

Ramp metering on the SR 204 and 20th Street SE on-ramps was evaluated as a standalone solution as part of the US 2 CPS; “the results indicated that although there would be operational benefits to metering the SR 204 and 20th Street SE WB on-ramps, construction costs and challenges outweigh the benefit.”⁹ All concepts developed as part of this report allow for the possibility of ramp metering; metering alone was not investigated as a solution in lieu of construction, as this would only cause additional queuing and increased travel time for traffic entering US 2 at the US 2/SR 204/20th Street SE interchange.

Nonmotorized

A connected bicycle network to allow safe movement through the study interchange was identified at a planning/sketch level of design; this is to be further developed in conjunction with the design of the selected alternative for improvement. (The network plan is shown in Figure 3-25.)

Transit

The transit route along 20th Street SE is being reviewed as part of long-range planning efforts by Community Transit and the City of Lake Stevens. Possible improvements include an HOV transit lane along 20th Street SE and onto US 2 WB at the study interchange. The 20th Street SE HOV lane could be constructed independent of the study interchange, but this would require buses and HOV to merge into the GP lanes near the Cavalero Road intersection. Some ramp modifications at the US 2/SR 204/20th Street SE interchange would be necessary to accommodate an HOV lane connection from 20th Street SE. The selected improvement alternative will be designed to not preclude future development of a transit lane onto US 2 via the 20th Street SE on-ramp. It is expected that this would improve transit reliability and therefore increase demand for this transportation mode. However, this mitigation alone is not anticipated to decrease the vehicle demand at the study interchange enough to meet the mobility goals of this study, and is therefore not an acceptable alternative to physical improvements at the study interchange.

HOV

An HOV bypass concept was investigated as Concept 5 in the US 2 Everett Port/Naval Station to SR 9 Corridor Planning Study¹⁰ to examine the benefit of providing an HOV lane on the 20th Street corridor located under the trestle. The design would use the existing Ebey Island on-ramp as a bypass for the US 2/SR 204/20th Street SE interchange as illustrated in Figure 1-7. The following is a description for the HOV lane bypass concept that was evaluated.



Figure 1-7. HOV Lower Roadway Bypass

Concept 5 assumed that the WB surface road (20th Street) on Ebey Island would be improved for use as a transit and HOV traffic bypass for WB traffic from 20th Street SE/Hewitt Avenue. Several changes to existing speeds and intersection configurations were also included to encourage traffic to use the Ebey Island surface road.¹¹

The analysis results for this concept revealed some operational benefit at the study interchange:

The Ebey Island bypass concept (Concept 5) assumed that the WB surface road (20th Street) on Ebey Island would be modified for use as a traffic bypass for WB traffic from 20th Street SE/Hewitt Avenue. Along with other minor geometric and operational changes, the analysis found that about a third of the WB traffic from 20th Street/Hewitt Avenue would divert to the surface road (20th Street) on Ebey Island as a bypass. These vehicles would then merge back onto the trestle from the US 2 WB on-ramp. Overall, use of the Ebey Island bypass would not improve the WB US 2 trestle traffic operations during the AM peak hour. However, this concept would improve the traffic operations at the 20th Street SE/SR 204 interchange and would reduce the congestion and queue lengths along WB 20th Street SE/Hewitt Avenue.¹²

However, the traffic analysis showed that increasing the number of vehicles that merge onto the WB trestle at the Ebey Island on-ramp would adversely affect traffic conditions on the US 2 trestle. The impacts to the US 2 trestle would outweigh benefits received by vehicles using the lower roadway. It was also determined that if transit were to use the lower roadway vehicles would be required to travel at much slower speeds than could be achieved on the trestle. The HOV bypass concept was revisited as part of this IJR, as documented in Appendix F, which came to the same conclusion. These conditions were discussed with the state and local stakeholders, and it was determined that there would not be a corridor person-mobility benefit received from the HOV bypass concept. The concept may be considered as a potential intermediate solution for phasing into construction of the final preferred alternative.

A second HOV bypass concept was evaluated as part of this IJR. The concept entails a 2+ HOV bypass lane along 20th Street SE from 83rd Ave to the US 2/SR 204/20th Street SE interchange. Analysis shows that this HOV bypass would result in a 2-minute travel time savings for HOV travelers along 20th Street SE; this falls under the jurisdiction of the City of Lake Stevens, and design of the US 2/SR 204/20th Street SE interchange will not preclude implementation of this HOV concept should the City of Lake Stevens choose to construct the improvements. More information regarding the analysis of both HOV concepts is presented in the HOV Bypass Technical Memorandum (Appendix F).

1.3.2 Local Improvements

The most significant improvement to the local roadway network with the potential to directly impact the flow of traffic onto WB US 2 are the high-occupancy vehicle (HOV) bypass lane concepts discussed in the previous section.

1.3.3 Alternative Routes

This report discusses improvements to an existing interchange; it would be unreasonable to expect drivers to travel farther east to access WB US 2, given the proximity to I-5/US 2 interchange and since there are no other local alternative routes to cross Ebey Island. The closest crossing to the north is through the City of Marysville, which is already operating over capacity. The closest southern crossing, Lowell Snohomish River road, is located 6 miles to the south. The SR 9 corridor that provides access to the southern route operates at capacity. The potential for increasing demand to the downstream access point, the on-ramp from Ebey Island surface streets, was discussed previously in section 1.3.2 as an HOV-bypass concept.

1.4 REGIONAL PROPOSED/PLANNED IMPROVEMENTS

The baseline transportation network model accounts for currently planned improvements listed in the PSRC Transportation 2040 plan. Appendix A, Table 7 contains a comprehensive list of proposed improvements that are included in the future baseline models. The following improvements are of significance:

- US 2 widening (WB trestle)
- US 2 widening (Bickford Avenue to Monroe)
- 20th Street SE widening
- US 2/SR 9 interchange reconstruction
- I-5 widening (Marine View Drive to SR 528/529)
- I 5/SR 529 interchange reconstruction
- Sound Transit light rail to Everett Station

Figure 1-8 illustrates these key future projects assumed in the baseline for analysis.

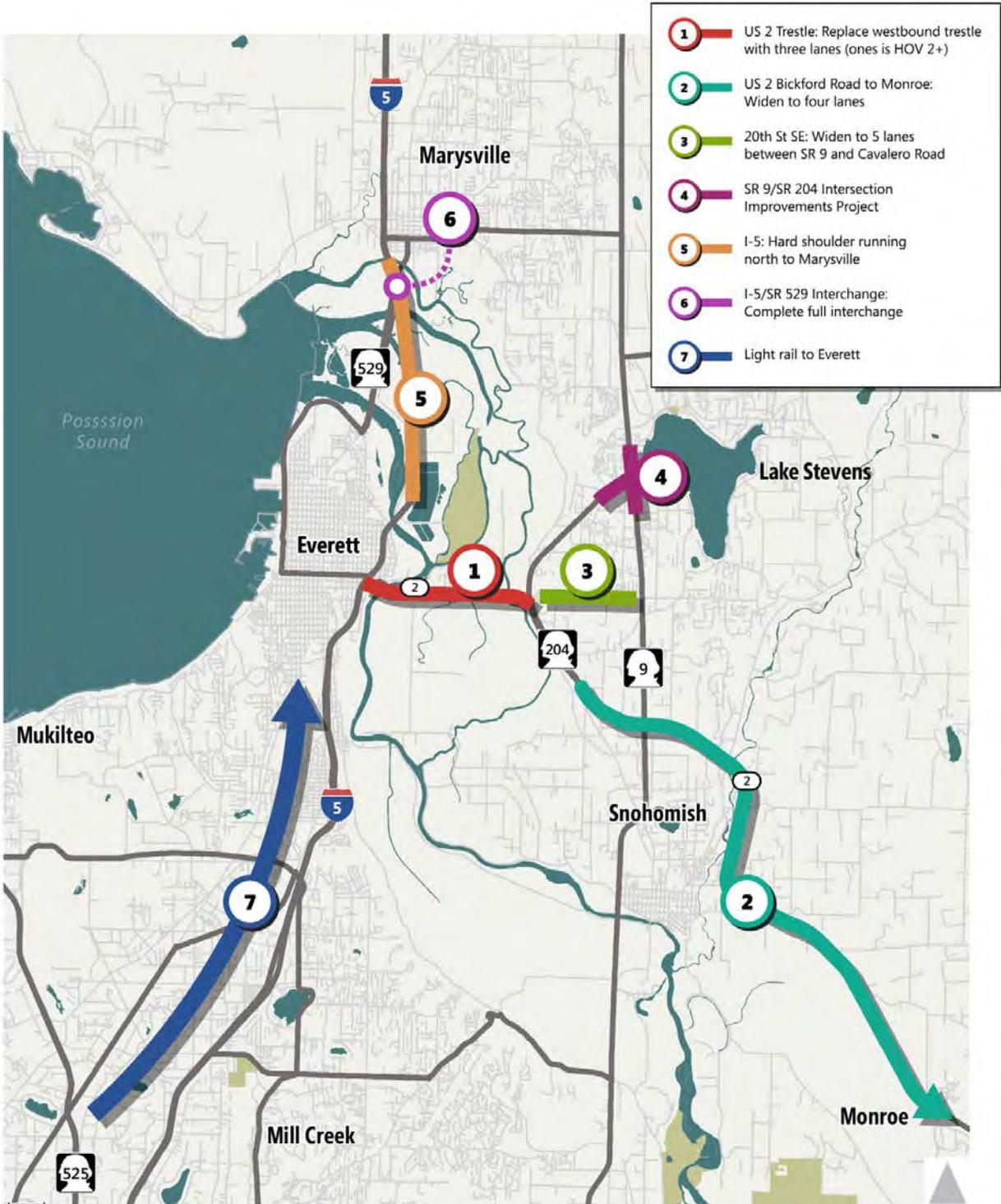


Figure 1-8. No-Build Network Assumptions

1.5 RESULTANT IMPROVEMENTS

This section describes improvements to the existing network that would be needed as a result of the proposed interchange modifications.

The proposed improvements would be integrated with the existing roadway network to ensure that no additional improvements would be needed on either local roads or the highway. The proposed interchange configuration is designed to allow but not require future widening improvements along mainline US 2 WB. However, it is assumed for this study that US 2 WB be widened to four lanes between the study interchange and I-5 in order to realize the benefit of interchange improvements to US 2 traffic. Future decisions about the final lane configuration on the US 2 trestle are dependent on the outcome from a full NEPA/SEPA and design project. Findings could also depend on decisions regarding the project funding and finance decisions.

⁴ “Urban Growth Area Maps”, Snohomish County, 2015, <https://snohomishcountywa.gov/3406/Urban-Growth-Area-Maps>

⁵ “Prompt-List for Reviewing Interstate Access Requests”, FHWA, 2010, https://www.fhwa.dot.gov/modiv/programs/intersta/docs/FHWA_Policy_Points_Promptlist.pdf

⁶ WSDOT Northwest Region, “US 2: Everett Port/Naval Station to SR 9 Corridor Planning Study” (2016)

⁷ Fehr & Peers, “Traffic Analysis Report - US 2: Everett Port / Naval Station to SR 9 Corridor Planning Study” (2016)

⁸ Ibid.

⁹ US 2 Everett Port/Naval Station to SR 9 Corridor Planning Study

¹⁰ US 2 Everett Port/Naval Station to SR 9 Corridor Planning Study

¹¹ Fehr & Peers, “Traffic Analysis Report - US 2: Everett Port / Naval Station to SR 9 Corridor Planning Study” (2016)

¹² Ibid.

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POLICY POINT 2. REASONABLE ALTERNATIVES

Describe all reasonable alternatives that have been considered.

The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).

2.1 STUDY AREA

The project limits for the traffic analysis and modeling include the I-5 corridor from the Pacific Street interchange to the Marine View Drive Interchange, US 2 from the I-5 Interchange to east of the Bickford Avenue interchange, 20th Street SE from 51st Avenue SE to Cavalero Road, and SR 204 from the US 2/20th Street SE interchange to 81st Avenue SE.¹³

This area surrounds the location of all reasonable alternatives as well as the extent of immediate influence of the US 2/SR 204/20th Street SE interchange. Figure 2-1 shows the study area and the data collection points.

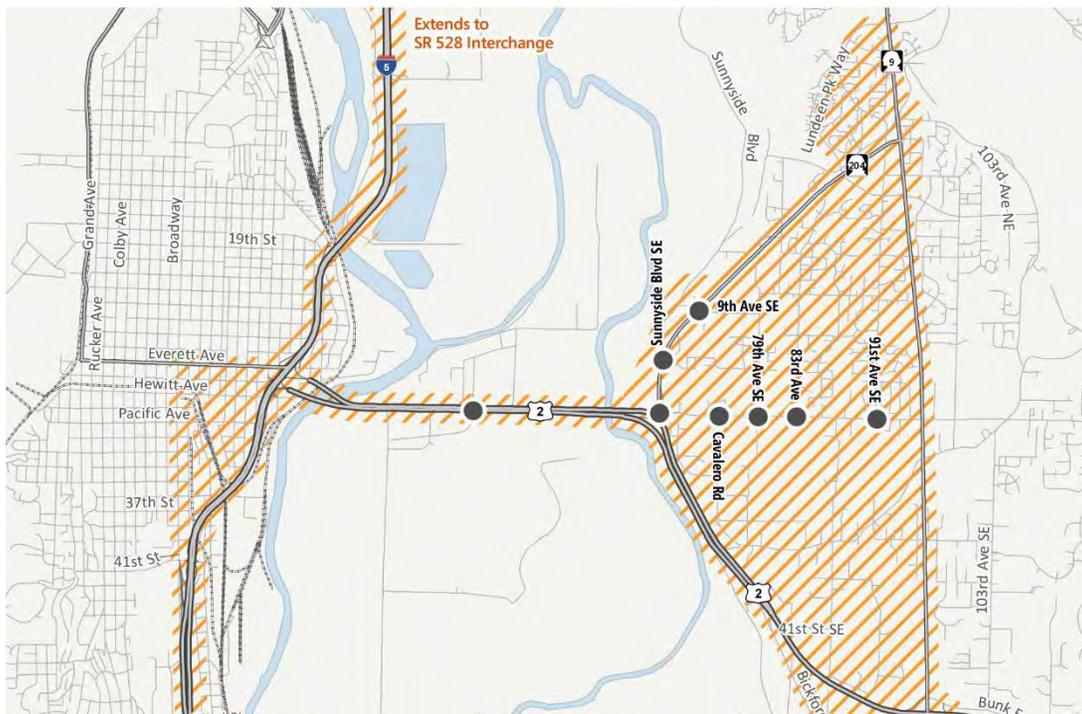


Figure 2-1. Study Intersections and Data Collection Locations

2.2 ALTERNATIVES CONSIDERED

This section addresses all improvements considered to address the project need, including transportation system management (TSM) and geometric design concepts. The qualitative concept screening process is described to highlight the selection of three alternatives. The follow-on technical alternative comparison process is summarized to document the selection of a preliminary preferred alternative.

2.2.1 Transportation Systems Management and Operations

TSMO Evaluation/Consideration Method/Procedure

Planned future TSMO improvements are included in the EMME demand model, which is used to estimate demand prior to forecasting future traffic volumes used in further operational analysis. Additional strategies investigated as part of this study were evaluated using more detailed transportation modeling software, specifically Dynameq and Vissim, which were used to build a dynamic traffic assignment (DTA) model and a microsimulation traffic model respectively.

Planned Future TSMO Strategies

Expanded transit service as assumed in the PSRC Transportation 2040 is included in the baseline network model. Assumed US 2 trestle transit service improvements include increased frequency from 12 WB/11 EB to 21 WB/23 EB trips during peak AM hours, as well as the addition of EB service from the Lynnwood Transit Center. A nearly doubling of transit service helps to remove some vehicle trips from the system and allow better traffic flow. The transit service alone is not enough to eliminate severe congestion in the year 2040 No Build condition.

Potential TSMO Strategies Considered

The US 2 CPS¹⁴ investigated Intelligent Transportation Systems (ITS) improvements as Concept 1, including Active Traffic Management (ATM) and HOV lanes along I-5 and a peak-period HOV bypass to access US 2 WB from 20th Street SE via Ebey Island. This alternative failed to meet the demand on US 2 WB and is not viable as a standalone concept. The Preliminary Preferred Alternative (PPA) will include an expansion of the existing ATM system by installing variable message signs along the corridors within the improvement area. See the proposed sign plan in Policy Point 3 (Figure 3-24) for proposed sign locations.

The HOV bypass element was revisited separately as part of this IJR study; results of the operational analysis showed this configuration to be of little benefit to the bypass users and detrimental to the overall operations on US 2. (See HOV Bypass Technical Memorandum, Appendix F) The same analysis showed that there is some travel time benefit to 20th Street SE travelers with the addition of an HOV lane between 83rd Ave SE and the study interchange, but this does not improve conditions at the interchange or along US 2.

Ramp metering was evaluated as part of the US 2 CPS¹⁵, but as evaluated in this IJR, ramp meters created significant congestion upstream of the ramps and were not carried forward as a standalone improvement.

TOLLING

The State Legislature funded a US 2 West Trestle Funding and Finance study to evaluate the many different sources for funding to replace the westbound US 2 trestle including tolling.

Preliminary transportation forecasts showed that traffic volumes on the US 2 trestle would decrease between 25 to 30% as a result of the tolls.

Because tolling has not been selected as a funding source for the project, the IJR did not include tolling for the transportation forecasting effort.

However, the concepts considered in this study do not preclude use of ramp metering for demand management, or as a way to facilitate HOV or transit bypass. Using a bypass meter could improve travel time reliability for transit users depending on the local roadway configuration, the ramp configuration, and the ramp meter locations.

2.2.2 Build Alternatives

This section describes eight improvement concepts explored to address the project needs at the interchange of WB US 2 and SR 204/20th Street SE. Two concepts were also developed to provide improvement options for eastbound traffic at the study interchange.

Concept 1 – New SR 204 Ramp

Concept 1 (Figure 2-2) eliminates the merge of SR 204/20th Street SE traffic. The single-lane US 2 mainline is maintained between the SR 204 off-ramp and the 20th Street SE on-ramp; the SR 204 on-ramp is relocated north with a larger-radius — and therefore higher-speed — on-ramp that joins the US 2 mainline as an add lane. The on-ramp from 20th Street SE joins the US 2 corridor as an add lane between the SR 204 and US 2 lanes. Because all three origins (SR 204, 20th Street SE, and US 2) join the trestle as individual add lanes, no merges are required. The northern lane is assumed to be striped as an HOV lane just west of the Ebey Slough crossing. At that point, GP traffic from SR 204 would have to exit the lane by merging to the left. The design for this concept would not allow traffic from SR 204 or 20th Street SE to access the westbound Ebey Island off-ramp. Based on the assumption that the design would have to replace existing accessibility to homes on Ebey Island, the team recommended relocating Ebey Island access to the lower roadway at the SR 204/20th Street SE intersection. The Ebey Slough bridge on the lower roadway was assumed to be reconstructed to accommodate two-way traffic and to provide accommodations for bicycles and pedestrians.

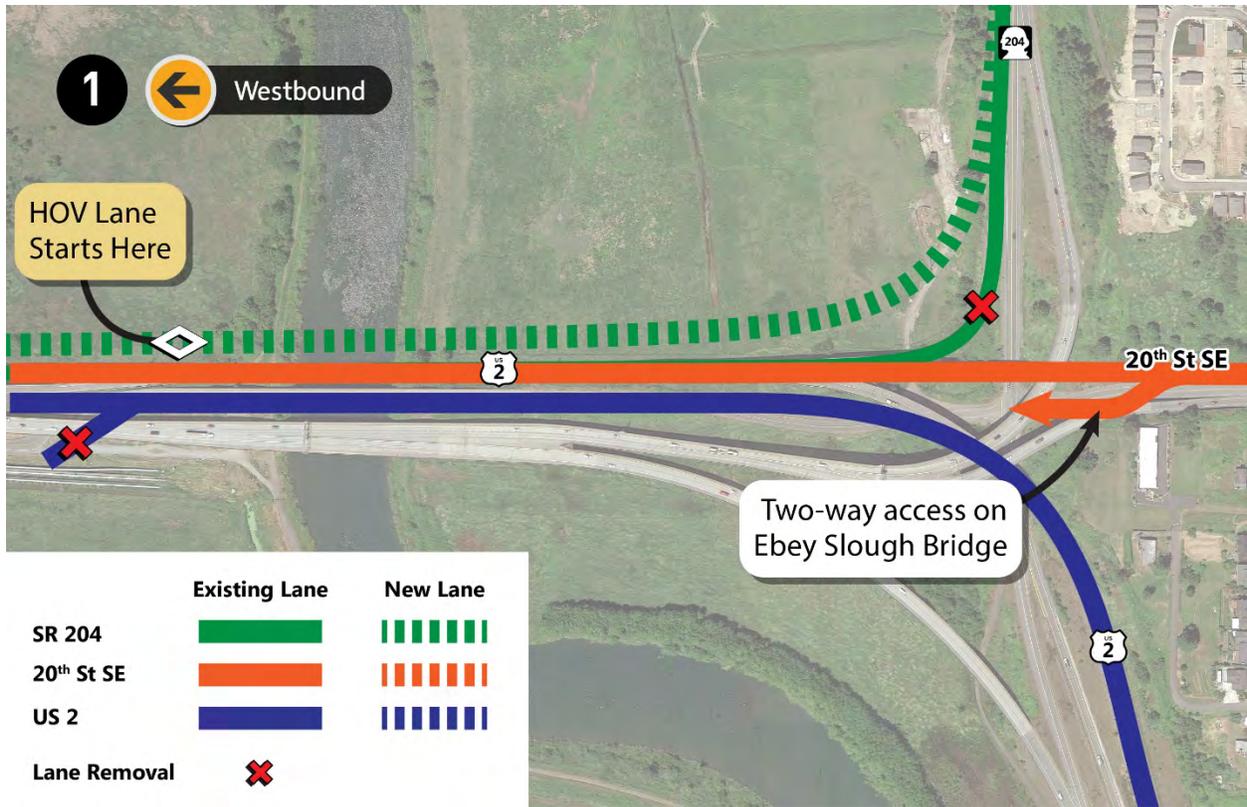


Figure 2-2. Concept 1 Layout

Concept 2 – Dual-lane SR 204 Ramp

Concept 2 (Figure 2-3) is similar to Concept 1 in its configuration except that it adds a second lane to the SR 204 on-ramp. This concept assumes that the inside ramp lane from SR 204 would merge with the 20th Street SE on-ramp over a longer distance than is available in the existing configuration. Both lanes are maintained after joining the single through lane on mainline US 2, which results in a total of three lanes on the US 2 trestle. There are no connections to Ebey Island because the WB off-ramp is closed, and no new connection was assumed for the lower roadway. Ebey Island would only be accessed from the eastbound trestle.

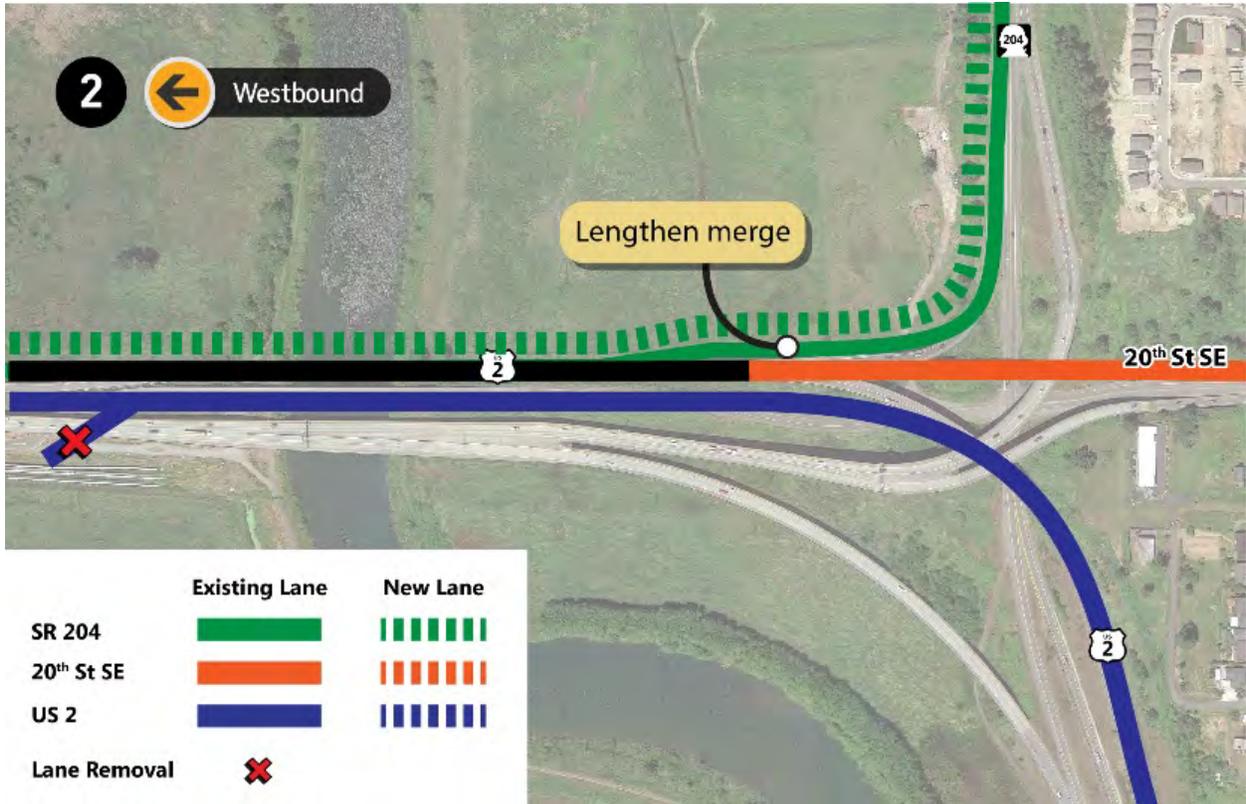


Figure 2-3. Concept 2 Layout

Concept 3 – Dual-lane US 2 Ramp; Lengthen SR 204/20th Street SE Merge

Concept 3 (Figure 2-4) maintains the existing on-ramp configuration but lengthens the merge of SR 204 and 20th Street SE traffic. Mainline US 2 westbound is assumed to maintain a two-lane cross section from the Bickford interchange onto the westbound trestle. It was also assumed that the westbound on-ramp from Bickford to US 2 would be a merge rather than an add lane configuration. This alternative eliminates the lane drop along US 2 and provides higher capacity for through traffic on the highway. There are no connections to Ebey Island because the WB off-ramp is closed and no new connection is made to the lower roadway. Ebey Island could only be accessed from the eastbound trestle.

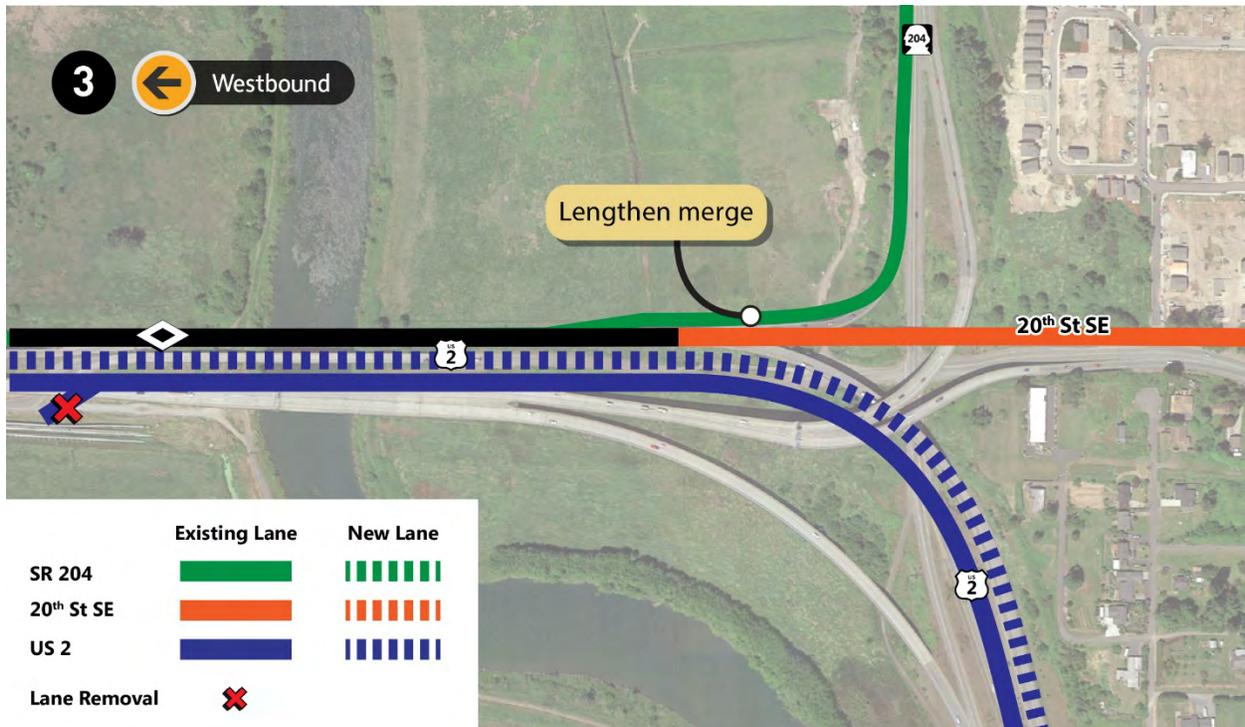


Figure 2-4. Concept 3 Layout

Concept 4 – Dual-lane US 2 and SR 204 Ramps

Concept 4 (Figure 2-5) adds a second lane to the on-ramp from SR 204, with the two lanes merging into one lane on the trestle. 20th Street would have its own lane through the study interchange. After the addition of the two lanes at the interchange, mainline US 2 is a total of four lanes wide; this is maintained across the trestle. This alternative also eliminates the lane drop along US 2 and provides higher capacity for through traffic on the highway. The Ebey Island off-ramp is maintained, but it is only accessible by traffic that originated on US 2 east of the study interchange.

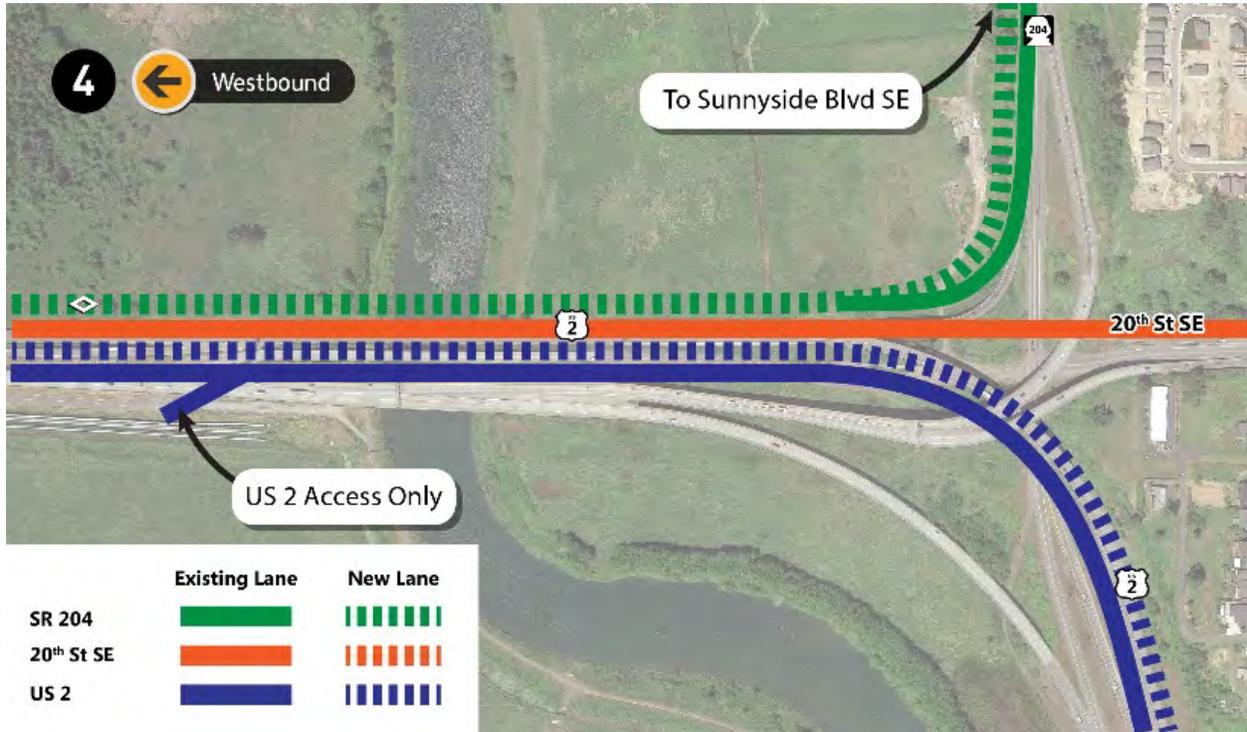


Figure 2-5. Concept 4 Layout

Concept 5 – Relocate 20th Street SE Ramp to Outer Lane

Concept 5 (Figure 2-6) eliminates the merge of SR 204 and 20th Street SE traffic by maintaining a separate lane for each as they join mainline US 2. The existing on-ramp from SR 204 is maintained, while a new overpass from 20th Street SE over SR 204 is constructed to allow a separate on-ramp from 20th Street SE to join mainline US 2 after the on-ramp from SR 204. Two lanes on US 2 are also provided. The WB off-ramp from US 2 to Ebey Island is removed and WB island access is provided by widening 20th Street SE under the trestle for two-way traffic.

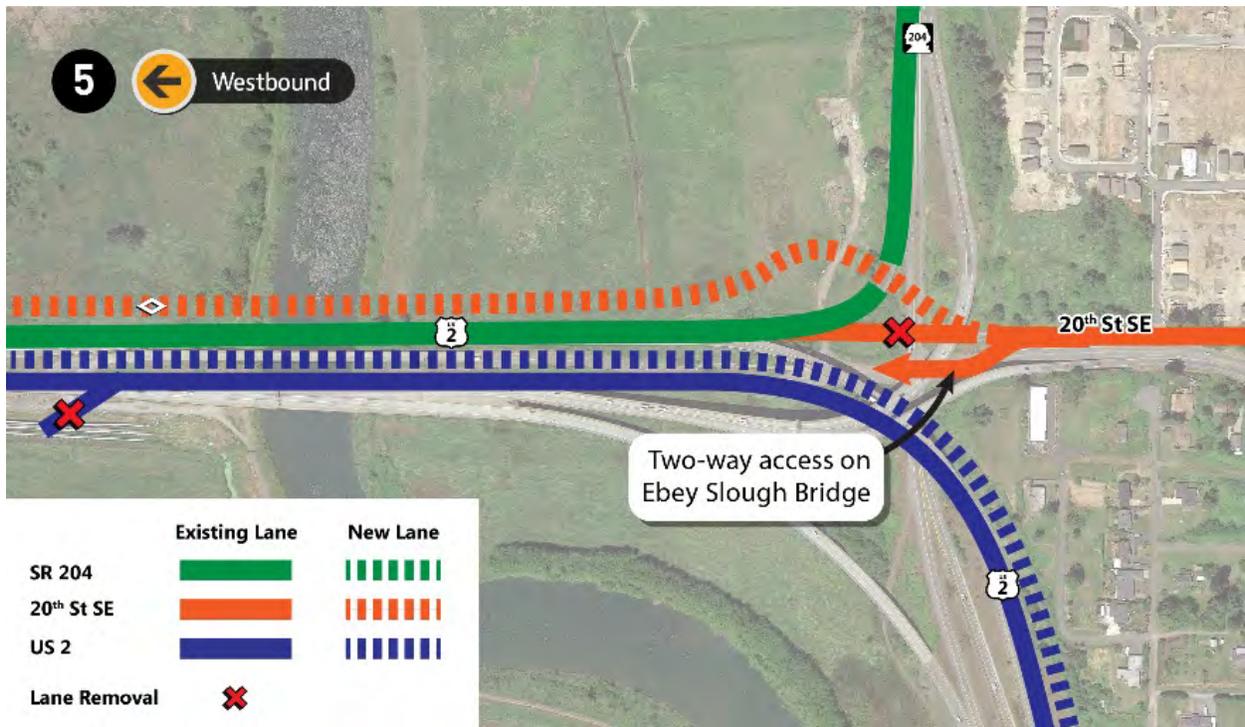


Figure 2-6. Concept 5 Layout

Concept 6 – Move 20th St SE Ramp to rebuilt lower roadway

Concept 6 (Figure 2-7) rebuilds the surface road underneath the US 2 trestle and routes 20th Street SE traffic bound for US 2 along this corridor. This eliminates the merge of 20th Street SE and SR 204; the existing SR 204 on-ramp would remain, as well as the existing single-lane mainline US 2 approaching the US 2/SR 204/20th Street SE interchange. The on-ramp from Ebey Island would be reconstructed at the west end of Ebey Island, leading to an add-lane on US 2 for the remainder of the distance to I-5. This concept requires the majority of improvements to take place as reconstruction of the local roadway.

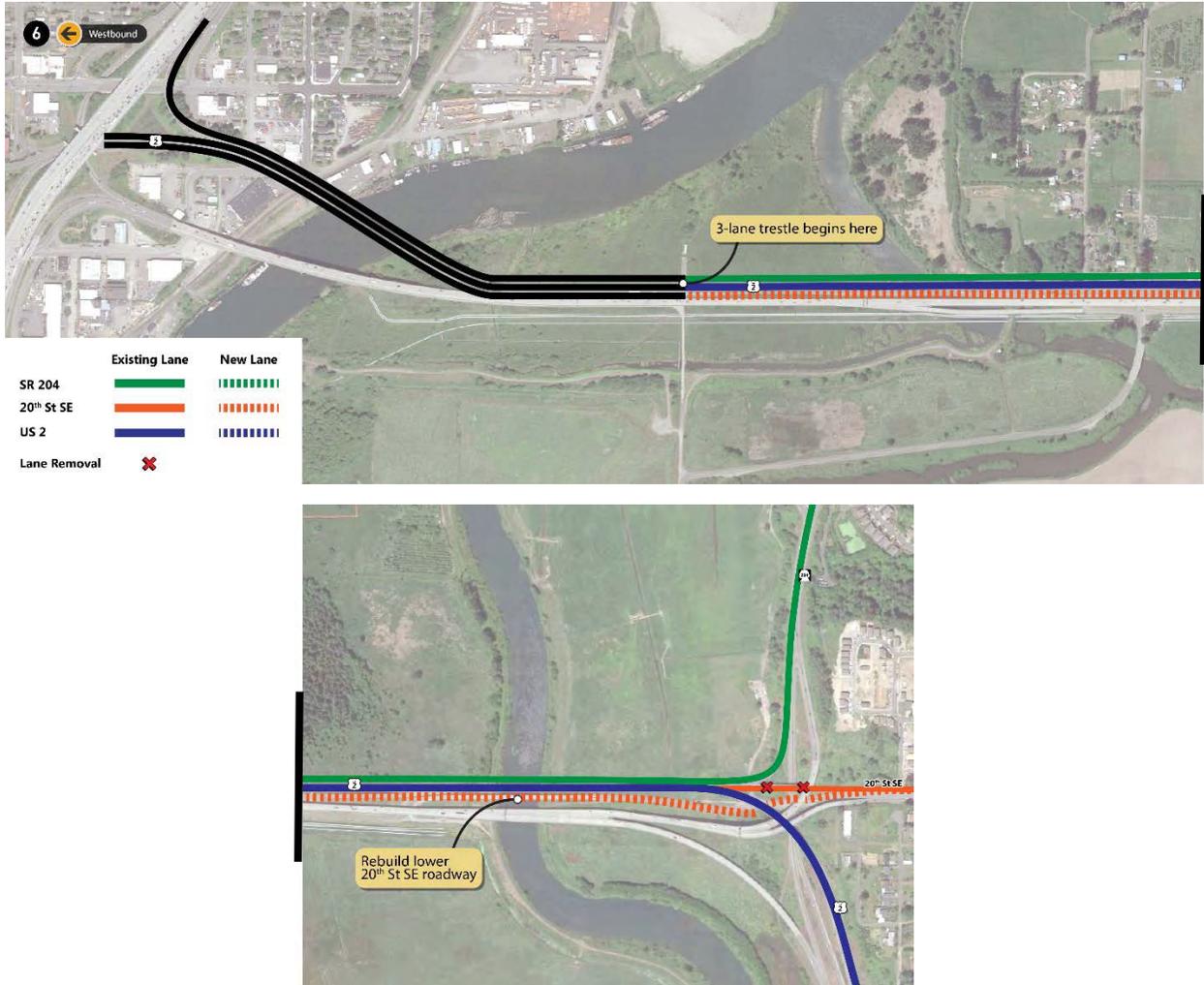


Figure 2-7. Concept 6 Layout

Concept 7 – Move SR 204 Ramp to Rebuilt Lower Roadway

Concept 7 (Figure 2-8) rebuilds the surface road underneath the US 2 trestle and routes SR 204 traffic bound for US 2 along this corridor. This eliminates the merge of 20th Street SE and SR 204; the existing 20th Street SE on-ramp would remain, as well as the existing single-lane mainline US 2 approaching the US 2/SR 204/20th Street SE interchange. The on-ramp from SR 204 would be constructed at the west end of Ebey Island; this lane addition would result in three lanes total for mainline US 2 WB, from this point to the I 5/US 2 interchange. This concept removes the risk of collision from the SR 204/20th Street SE merge and requires the majority of improvements to take place as reconstruction of the local roadway.

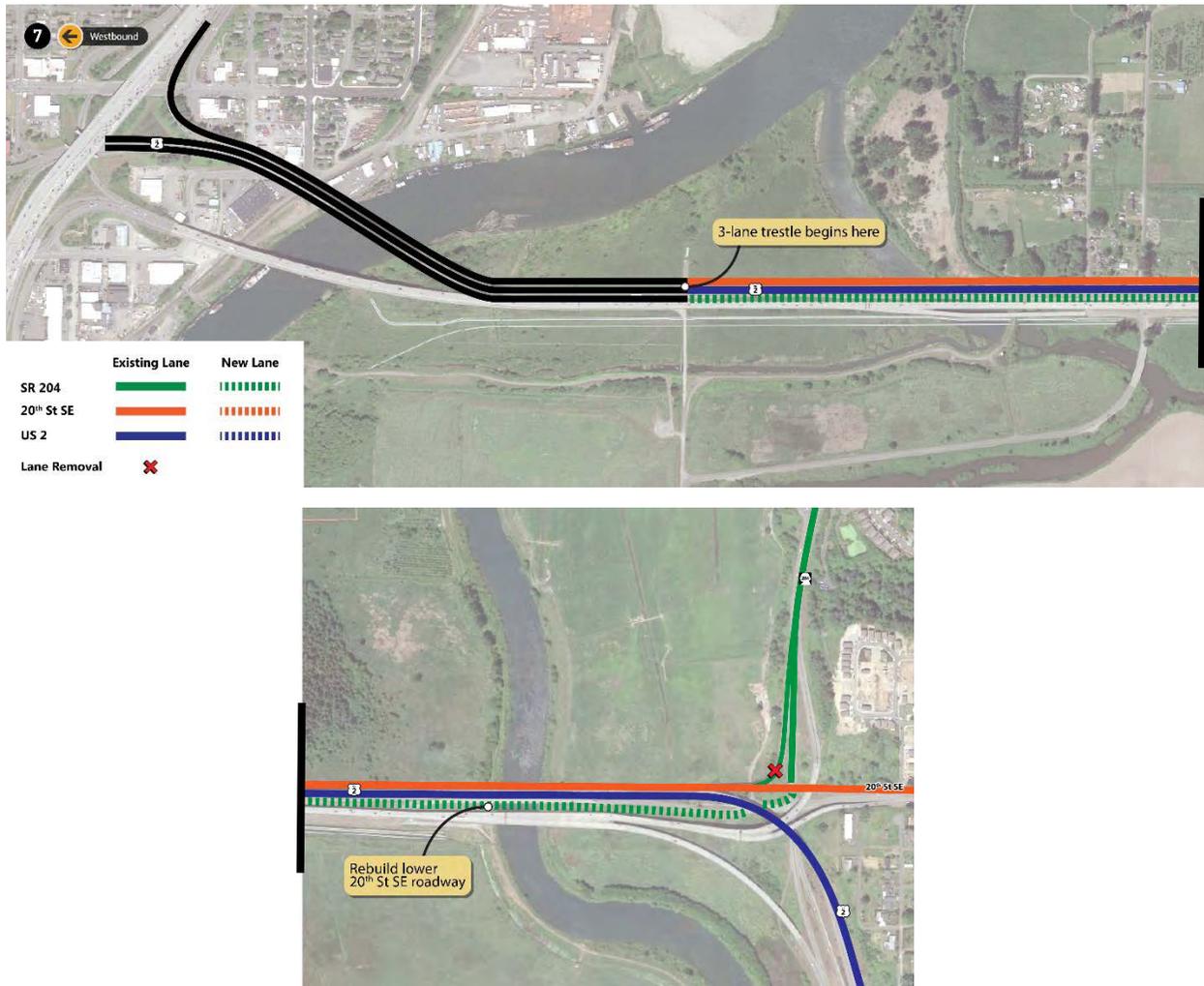


Figure 2-8. Concept 7 Layout

Concept 8 – Relocate 20th Street SE Ramp to US 2 South of the Interchange

Concept 8 (Figure 2-9) creates a new interchange for US 2 and 20th Street SE about 1 mile east of the existing interchange. Traffic traveling eastbound destined for 20th Street SE would use the new eastbound flyover ramp that would connect with Cavalero Road. They would then turn left onto Cavalero road and travel about 1 mile north to turn right at the Cavalero/20th Street SE intersection. Traffic from 20th Street SE destined for the westbound US 2 trestle would use the reverse route. This concept eliminates the lane drop along US 2 and provides higher capacity for through traffic on the highway. The existing SR 204 on-ramp is maintained in its existing configuration, joining mainline US 2 as an add lane for a total of three lanes across the WB trestle. This concept would require improvements to the local network, notably Cavalero Road, as well as WB and EB US 2, but it would eliminate the merge of SR 204 and 20th Street SE traffic.

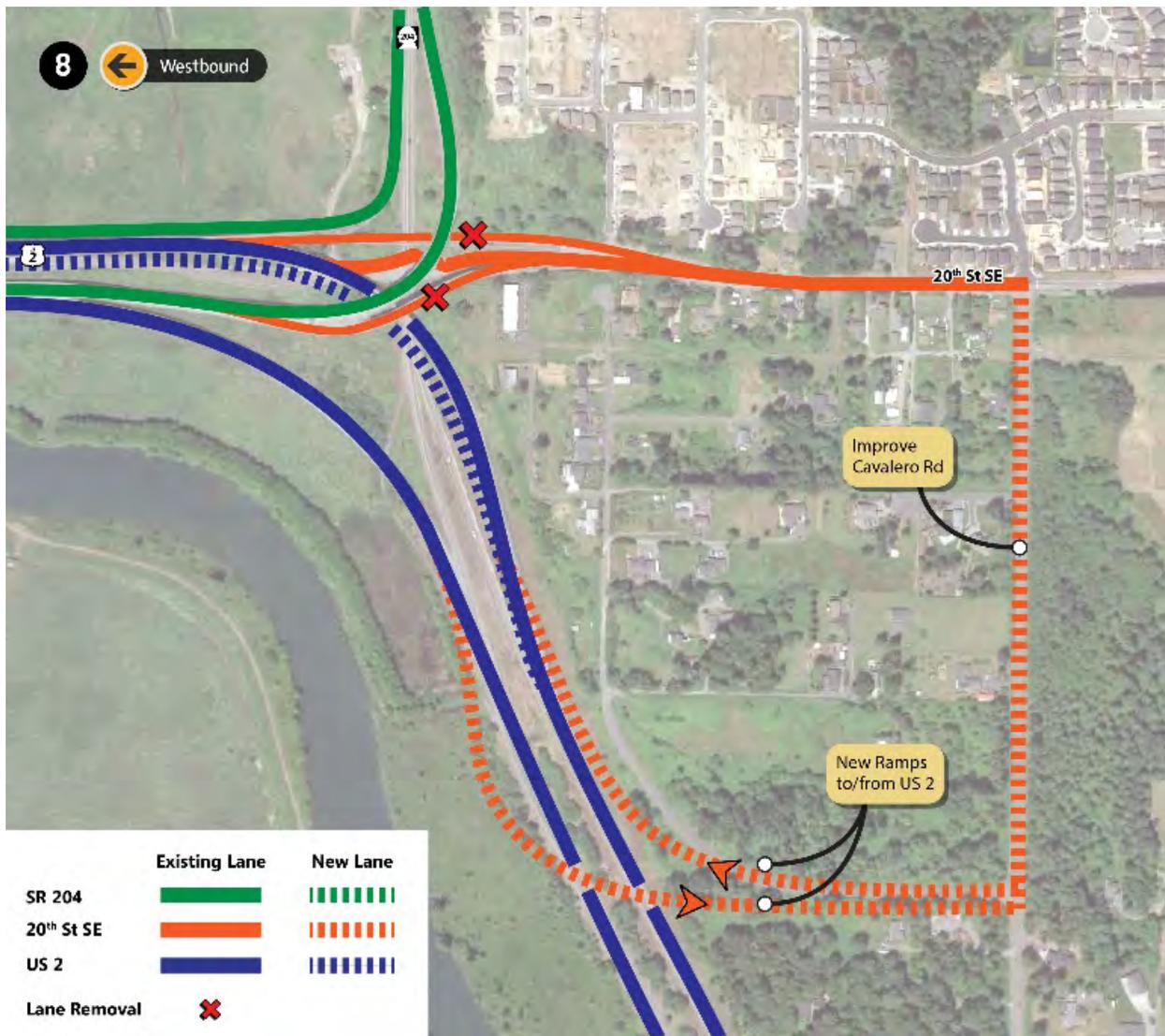


Figure 2-9. Concept 8 Layout

EB Network Improvements

Two options were developed for improvements to the study interchange. Option A (Figure 2-10) adds a second lane to the SR 204 off-ramp and realigns Sunnyside Boulevard to access SR 204 north of its existing access point, allowing additional space for traffic originating on US 2 EB to maneuver in anticipation of the Sunnyside Boulevard intersection. Concept B (Figure 2-11) also adds a second lane to the SR 204 off-ramp, but reconfigures the Sunnyside Boulevard intersection to prohibit left turns from SR 204 EB; these left turns would instead be facilitated at an upgraded Ninth Street SE. (This reconfiguration at Sunnyside Boulevard would only apply to concepts which convert the Sunnyside Boulevard intersection into a right-only add lane onto SR 204.)

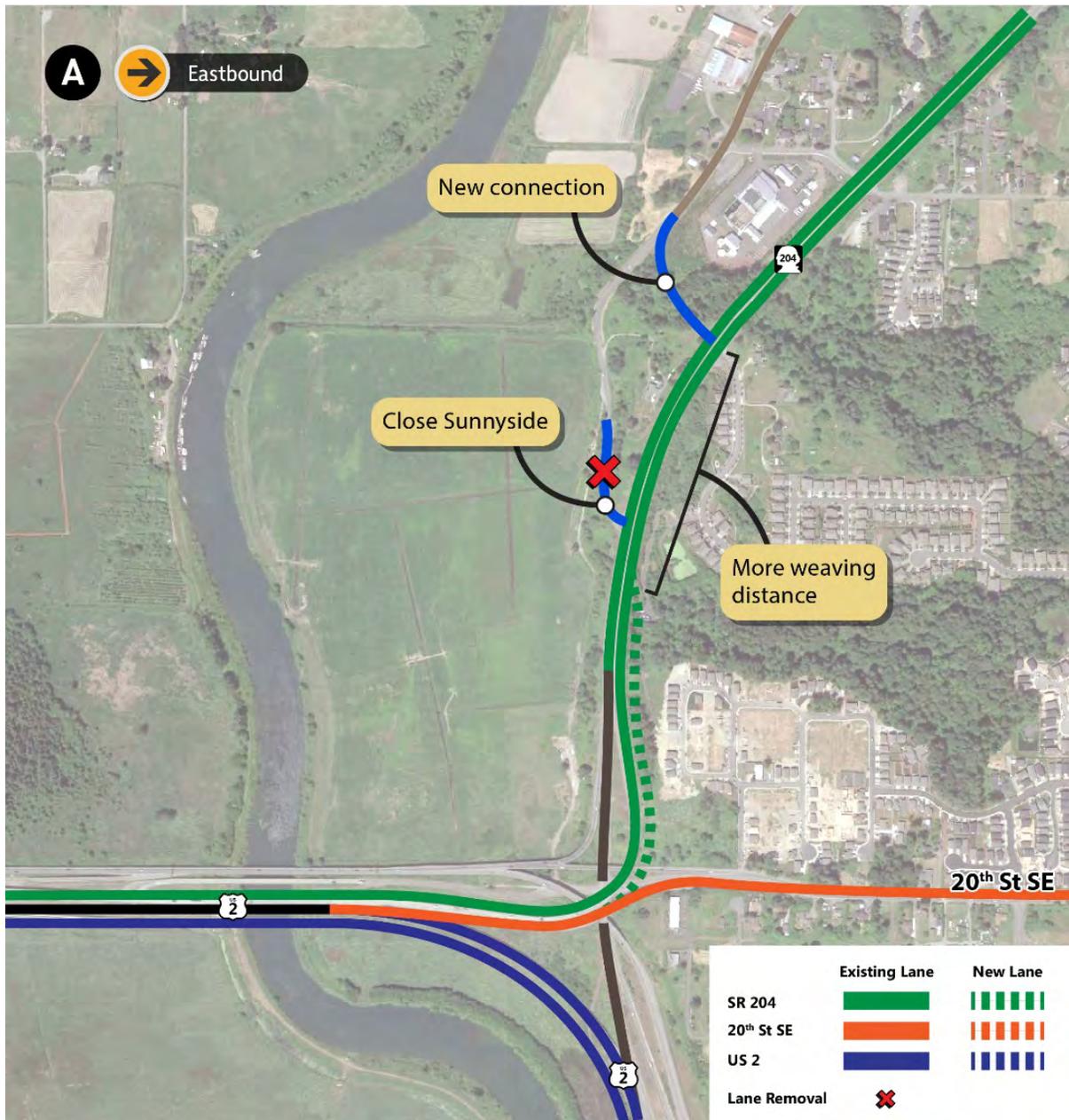


Figure 2-10. EB Improvements – Option A

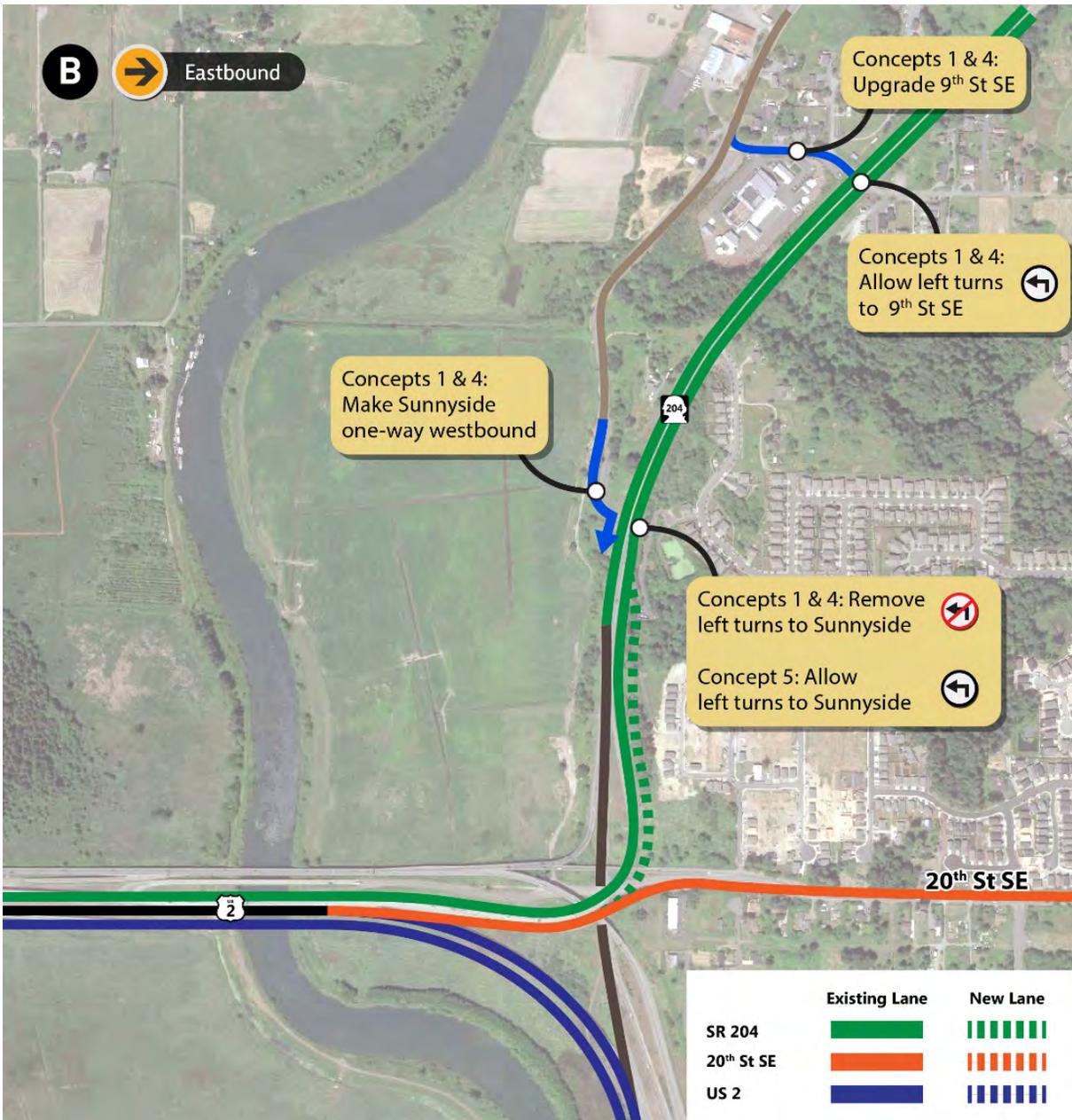


Figure 2-11. EB Improvements – Option B

2.2.3 Qualitative Concept Screening

Concepts 1 through 8 were presented to the IJR Support Team to select three alternatives for further analysis. Concepts were evaluated based on their ability to address the project need, likelihood for public/agency support, phasing potential, environmental impact, HOV/transit emphasis, implementation complexity, and overall system operational benefit. The EB concepts (A and B) were paired with the WB concepts as they best complemented each other.

Pedestrian and bicycle network improvements were developed independent of the interchange concepts as they were considered to move forward with any interchange concept selected. A sketch-level network

improvement plan was presented to the IJR Support Team as an example of several options for network modifications. The bicycle and pedestrian network improvements would be further developed in conjunction with interchange design during the design phase.

A preliminary concept screening was conducted by the IJR Project Team based on professional judgement and review of existing data. Next, the qualitative screening of the Concepts 1-8 was conducted with the IJR Support Team at Meeting 4 on August 16, 2017 (documented in Appendix F). In that meeting the qualitative evaluation by the project team was presented for review, along with a recommendation to pursue concepts 1, 3, and 5 as alternatives. After discussion and concurrence by the IJR Support Team that further investigation into the dual lane configuration from Sunnyside Road to the interchange would be advantageous, it was decided that concepts 1, 4, and 5 would be the alternatives for further analysis. The results of the qualitative concept screening are outlined in Table 2-1 and documented in Appendix H. Each of the numbered issues in Table 2-1 correspond with key needs that were identified through the IJR Support Team coordination. The non-numbered items are other considerations that are used by the industry to consider concepts at a qualitative level. Each concept's ability to address the issues was rated using a minus sign if the measure is degraded from existing, a zero for no change, a plus for some improvement, and double plus for the most improvement. The numbers to the right of each concept adds the value of the ratings. A negative sign received a -1, the zero was no points, a single plus was 1, and two pluses was 2. This method provided an easy to view comparison of the concept's ability to meet the project needs.

2.2.4 Technical Screening of Alternatives

Following initial evaluation and screening, three concepts were selected for further refinement and analysis. Concepts 1, 4, and 5 were renamed as Alternatives 1, 2, and 3, respectively. The alternatives were evaluated for operational performance and weighed against one another in terms of their ability to meet the project need to improve mobility while enabling integration with a future widened US 2 WB trestle. The operational analysis of each alternative for the AM peak hour of forecast year 2040 was used as the basis for comparison. The AM peak hour was chosen for comparison because traffic volumes on US 2 WB are significantly higher in the AM peak than the PM peak. The analysis includes planned Community Transit service and assumes peak commuter hour buses run near full seated capacity. The signalized intersections in the local network in Everett were assumed to be adjusted for signal optimization, to allow for maximum receiving capacity at the west end of US 2 to the extent possible with the existing infrastructure.

TABLE 2-1. QUALITATIVE CONCEPT SCREENING RESULTS

		Identified Operational And Safety Issues						Likely Public Support	Likely Agency Support	Environmental Impacts	Transit/HOV Emphasis	Phasing Potential	Implementation Complexity	Improvement to System Operations	Overall Rating (Total +)
		1	2	3	4	5	6								
		SR 204/20th Merge	US 2 drop lane merge	US 2 merge with SR 204/20th and Sunnyside Intersection	EB Diverge to US 2 and SR204/20th	High EB volume on SR 204 ramp									
Ratings:															
	<i>Minimal</i>	0	0	0	0	0	0	0	++	0	0	++	0 or -		
	<i>Somewhat</i>	+	+	+	+	+	+	+	+	+	+	+	+		
	<i>Substantial</i>	++	++	++	++	++	++	++	0	++	++	0	++		
Westbound Concepts															
1	New SR 204 Ramp	++	0	++	+	NA	NA	++	++	+	0	++	+	+	14
2	Dual lane SR 204 Ramp	+	0	++	++	NA	NA	+	+	+	0	0	+	0	9
3	Dual lane US 2 Ramp; lengthen SR204/ 20th St merge	0	++	++	+	NA	NA	+	+	+	0	+	+	0	10
4	Dual lanes US 2 and SR 204 Ramps	+	++	++	++	NA	NA	++	+	0	0	0	0	-	9
5	Relocate 20th St ramp to outside (could be 1 or 2 lanes)	++	0	++	+	NA	NA	++	++	+	+	++	+	+	15
6	Move 20th St ramp to rebuilt lower roadway	++	0	++	+	NA	NA	0	+	0	0	+	0	-	6
7	Move SR 204 ramp to rebuilt lower roadway	++	0	++	+	NA	NA	0	0	0	0	+	0	-	5
8	Relocate 20th St ramp to US2 south of interchange (reroute through Cavalero)	++	+	++	+	+	0	0	0	0	0	+	0	+	9
9	Reroute US 2 (e.g. SR 526 extension)														0
10	Parallel bridge for Everett-bound traffic														0
Eastbound Concepts															
A	Two lanes on SR 204 off-ramp plus relocated Sunnyside	NA	NA	NA	+	0	++	+	+	+	0	+	+	+	9
B	Two lanes on SR 204 off-ramp plus reconfigured Sunnyside Blvd and 9th St	NA	NA	NA	++	0	++	+	++	+	0	+	+	+	11

Highest Rated Concepts

Table 2-2 compares the design elements of Alternatives 1, 2, and 3. A description of each design as well as a summary of the operational analysis results follows. The alternatives and analysis findings were presented to the IJR Support Team for review at IJR Support Team Meeting 5, where it was decided to proceed with Alternative 3 (original Concept 5) as the Preliminary Preferred Alternative. The process is documented further in Appendix H.

TABLE 2-2. 2040 CONCEPTUAL ALTERNATIVE DESCRIPTIONS

	No-build	Build		
		Alternative 1	Alternative 2	Alternative 3
WB				
Lanes on the trestle	2 GP + 1 HOV	2 GP + 1 HOV	3 GP + 1 HOV	3 GP + 1 HOV
HOV lane location	Outside	Outside	Outside	Outside
US 2 WB to US 2 WB on-ramp	1 lane	1 lane	2 lanes	2 lanes
SR 204 WB to US 2 WB on-ramp	1 lane each merge	1 lane	2 lanes merge to 1	1 lane
20th St WB to US 2 WB on-ramp		1 lane	1 lane	1 lane
US 2 WB to Ebey Island off-ramp	Closed	Closed	Open (US 2 only)	Closed
Ramp meters on SR 204 and 20th St	No	No	No	No
HOV ramp meter bypass lanes	No	No	No	No
EB				
US 2 EB to US 2 EB off-ramp	2 lanes	2 lanes	2 lanes	2 lanes
US 2 EB to SR 204 EB off-ramp	1 lane	2 lanes	2 lanes	2 lanes
US 2 EB to 20th St EB off-ramp	1 lane	1 lane	1 lane	1 lane
SR 204 EB left turn to Sunnyside	Allowed	Prohibited	Prohibited	Allowed
SR 204 EB left turn to 9th St SE	Prohibited	Allowed	Allowed	Prohibited
Other				
20th St/SR 204	4-way stop	Signalized	Signalized	Signalized
Ebey Slough Bridge	One-way (EB)	Two-way	One-way (EB)	Two-way

No-Build Alternative

A future no-build alternative was evaluated for determination of the need to pursue improvements to the US 2/SR 204/20th Street SE interchange. This no-build was used as a baseline upon which to design several alternatives for improvements. The no-build alternative assumes no upgrades to the existing interchange or immediately surrounding roadways except for the main US 2 Trestle WB, which is assumed to have a 3rd lane for use by HOVs only. Primary network improvements included in the baseline or no-build alternative include the following:

- Reconstruction of the WB US 2 trestle bridge and expansion of the US 2 mainline to three lanes from the point of the study interchange to I-5
- Two GP and one HOV (2+) lane along mainline US 2 WB

- An HOV bypass lane added to the I-5 SB on-ramp from US 2 WB
- US 2 is widened to four lanes total between Monroe and Bickford Avenues
- US 2 WB on-ramp from Bickford Avenue enters as a merge lane (currently an add lane)
- 20th Street SE is widened to five lanes (two in each direction; one two-way left turn lane)
- Completion of SR 9/SR 204 intersection improvements
- I-5 NB uses a peak-use shoulder lane from Marine View Drive to Marysville
- I-5/SR 529 interchange improvements are complete (a complete interchange is in place)
- Light rail service to Everett from Seattle is operational

Existing Interchange

The existing study interchange (Figure 2-12) is located approximately 2 miles east of I-5 and the city of Everett. The interchange is at a horizontal curve in US 2; WB US 2 drops to one lane before this curve. The off-ramp from WB US 2 to EB SR 204 is a left exit before the mainline curves west; the on-ramp from SR 204 and 20th Street SE join the mainline as a single add lane downstream of the mainline US 2 curve. Prior to entering WB US 2, on-ramps from SR 204 and 20th Street SE merge to a single lane. 20th Street SE is the primary alignment and proceeds downhill and along a straight path to join US 2. SR 204 traffic enters via a horizontal curve to the right, yielding to 20th Street SE traffic as it merges into the on-ramp. WB US 2 maintains two lanes downstream of the study interchange across the US 2 westbound trestle.

EB US 2 is also two lanes across Ebey Island; at the US 2/SR 204/20th Street SE interchange, the left lane exits and separates into two flyovers toward EB SR 204 as a right-hand add lane and 20th Street SE as a right-hand merge. The right lane continues as mainline US 2 around the horizontal curve to the south, where EB SR 204 joins as an add lane to the left. The EB shoulder is used as a third lane during PM peak hours.

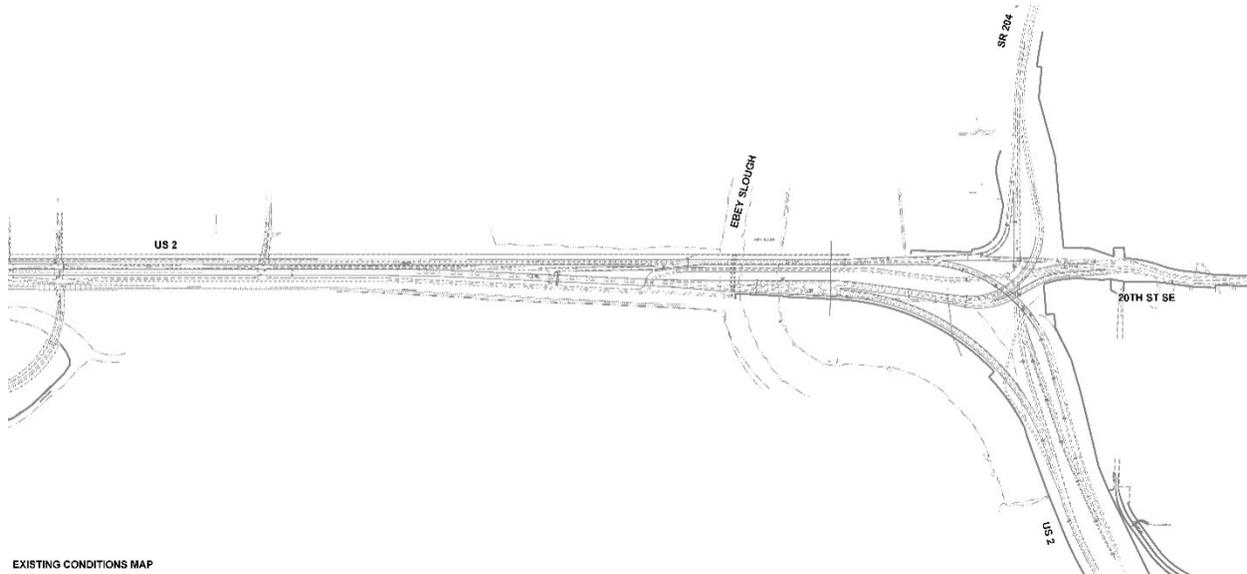


Figure 2-12. Existing Interchange Layout

Operational Inadequacies

The results of operational and safety analyses of the no-build alternative are presented in Policy Point 3. Each of the three alternatives was evaluated on its ability to address the operational shortfalls introduced in the Introduction chapter.

Key network elements that cause operational shortfalls include the following:

SR 204/20th Street SE Merge (WB)

- AM peak period volumes exceed the available capacity at a restricted merge location and create substantial queues on both merging roadways. Potential high-frequency collision location due to limited sight distance.

US 2 Drop Lane Merge (WB)

- Two lanes on US 2 merge into one lane upstream of the study interchange, resulting in queues developing on US 2 during the AM peak period. The volumes in the AM peak hour exceed the capacity of the single lane.

SR 204/20th Street SE On-Ramps and Downstream Ebey Island Off-Ramp (WB)

- SR 204/20th Street SE on-ramps join WB US 2, followed by a left exit to Ebey Island. This presents a weaving conflict between vehicles that entered US 2 at the study interchange and exit at the Ebey Island off-ramp 1,800 feet later, and those that were already traveling along WB US 2. These conflicts contribute to queues and safety concerns, primarily during AM peak period. A small volume of traffic volume exits at the Ebey Island off-ramp; however, if that traffic must cross lanes of traffic between on- and off-ramps, it is considered a weave. This section of the trestle is also complicated by traffic making lane changes to align for the off-ramps at the US 2/I-5 interchange on the west end of the trestle.

Sunnyside Boulevard Intersection (both directions)

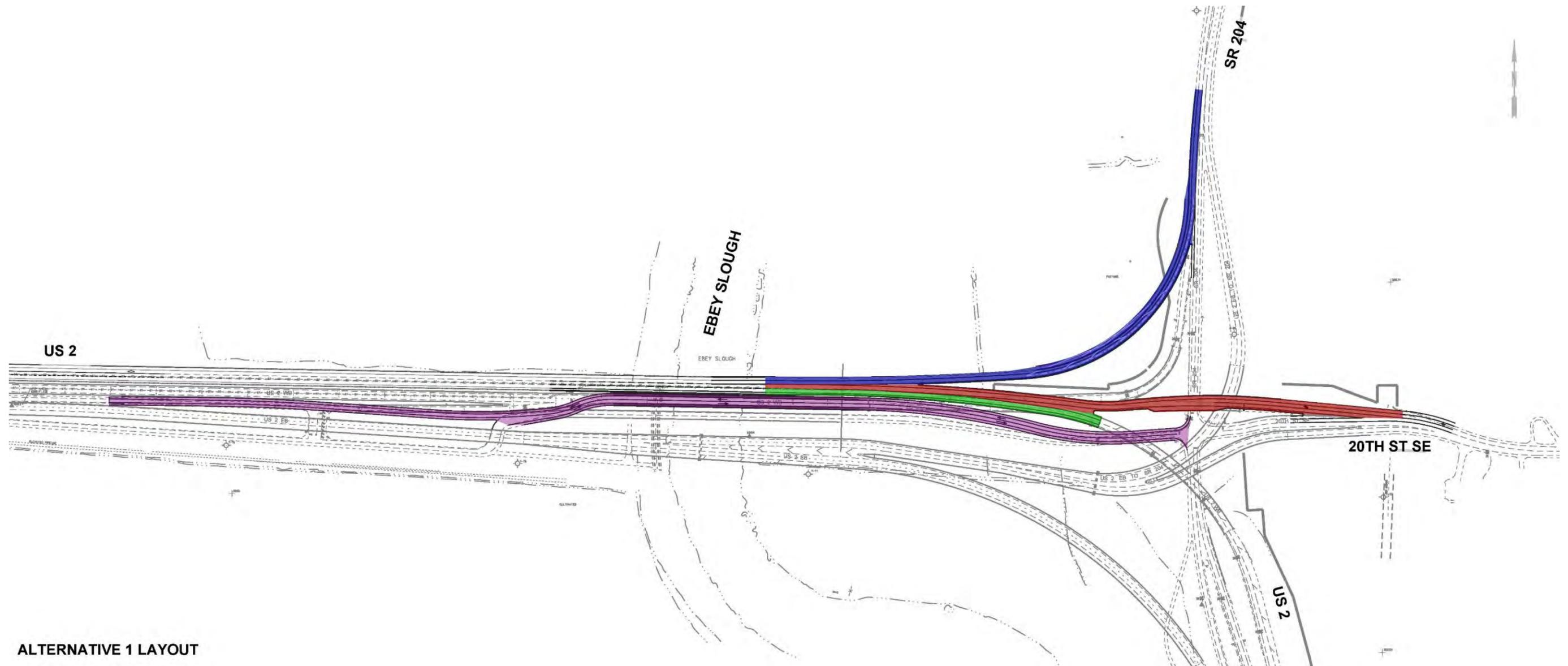
- The Sunnyside Boulevard intersection with SR 204 is closely spaced with the US 2/SR 204/20th Street SE interchange. At its junction with SR 204, Sunnyside Blvd is controlled by a STOP sign. During the AM peak period, heavy southbound volumes on Sunnyside create queues waiting for traffic gaps on SR 204. During the PM peak period, the reverse movement occurs, with heavy northbound volumes on SR 204 wanting to turn left onto Sunnyside causing queues on SR 204.

US 2 Diverge to US 2 and SR 204/20th Street (EB)

- During the PM peak period, the EB left-hand diverge from US 2 to 20th Street/SR 204 causes some moderate delays and queuing. After this point, drivers must decide whether to diverge left to SR 204 or proceed straight to 20th Street SE. These multiple decision points create traffic delays and queues.

SR 204 Off-Ramp Volume (EB)

- During the PM peak period, the SR 204 off-ramp carries very high traffic volumes, which must merge with traffic entering SR 204 from the US 2 WB off-ramp and 20th Street SE in close proximity to the Sunnyside Boulevard intersection (see Issue 4).



ALTERNATIVE 1 LAYOUT

Figure 2-13 Alternative 1 Layout

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Alternative 1

Alternative 1, shown in Figure 2-13, lays out three lanes entering the assumed three-lane WB trestle with two-way access on the lower Ebey Slough bridge. SR 204 and 20th Street SE join the single mainline US 2 lane; each add lane is maintained across the trestle as a three-lane cross section.

Alternative 1 Design

The US 2 mainline would be realigned to enter the WB trestle as a single add lane.

The SR 204 on-ramp would join the US 2 corridor as an add lane on the right side of the structure.

The 20th Street SE on-ramp was designed with the assumption that this corridor could include an HOV as part of this interchange project or at some time in the future. The design was set to not preclude the future inclusion of an HOV bypass lane. The on-ramp begins with two lanes, which merge into a single lane prior to joining the US 2 mainline as an add lane. The second lane could be used as an HOV bypass lane.

The design of the SR 204 and 20th Street SE on-ramps would prohibit people from accessing the existing westbound off-ramp to Ebey Island. The IJR Support Team concluded that an access point that provided full access to Ebey Island would have to be part of the alternative. To provide full access from SR 204, 20th Street SE, and US 2 to the homes on Ebey Island, the design included a new Ebey Island access at the intersection of SR 204 and 20th Street SE. Two-way traffic access on the Ebey Slough bridge would be accommodated and would include access for bicycles and pedestrians. It is assumed that the roadway would be striped with sharrows to provide cyclists with full access onto Ebey island.

An HOV lane on the WB trestle starts about 2,000 feet downstream of the study interchange.

Operational Benefits

Figure 2-14 Alternative 1 Operations. 2040 AM Peak illustrates the corridor speeds for Alternative 1. During the morning peak, Alternative 1 serves 575 more vehicles per hour (vph) than the No-build Alternative. The majority of the benefits are recognized by users of the SR 204 and 20th Street SE corridors; both save more than 10 minutes of travel time. Operational benefit to the local network is achieved by removing the merge condition for the SR 204 and 20th Street SE on-ramps. This improves the capacity of the SR 204 and 20th Street SE on-ramps and helps to reduce congestion on the local roads approaching the interchange.

In Alternative 1, The WB US 2 corridor would see longer travel times than the No-Build Alternative, on the order of 8 minutes per trip. Capacity on the trestle is insufficient to manage the increased demand from SR 204 and 20th Street SE. These vehicles were constrained on the surface streets in the No-Build Alternative, but in Alternative 1 they are now passing through the study interchange; many of these vehicles also maneuver into the left lane for access to southbound I-5. This delay along the US 2 trestle causes further delays on WB US 2 upstream of the study interchange.

Because more traffic can access the US 2 trestle from the study interchange, congestion is increased at the I-5/US 2 interchange. HOV traffic is able to bypass the congestion and recognize about a 2-minute travel time savings over GP traffic.

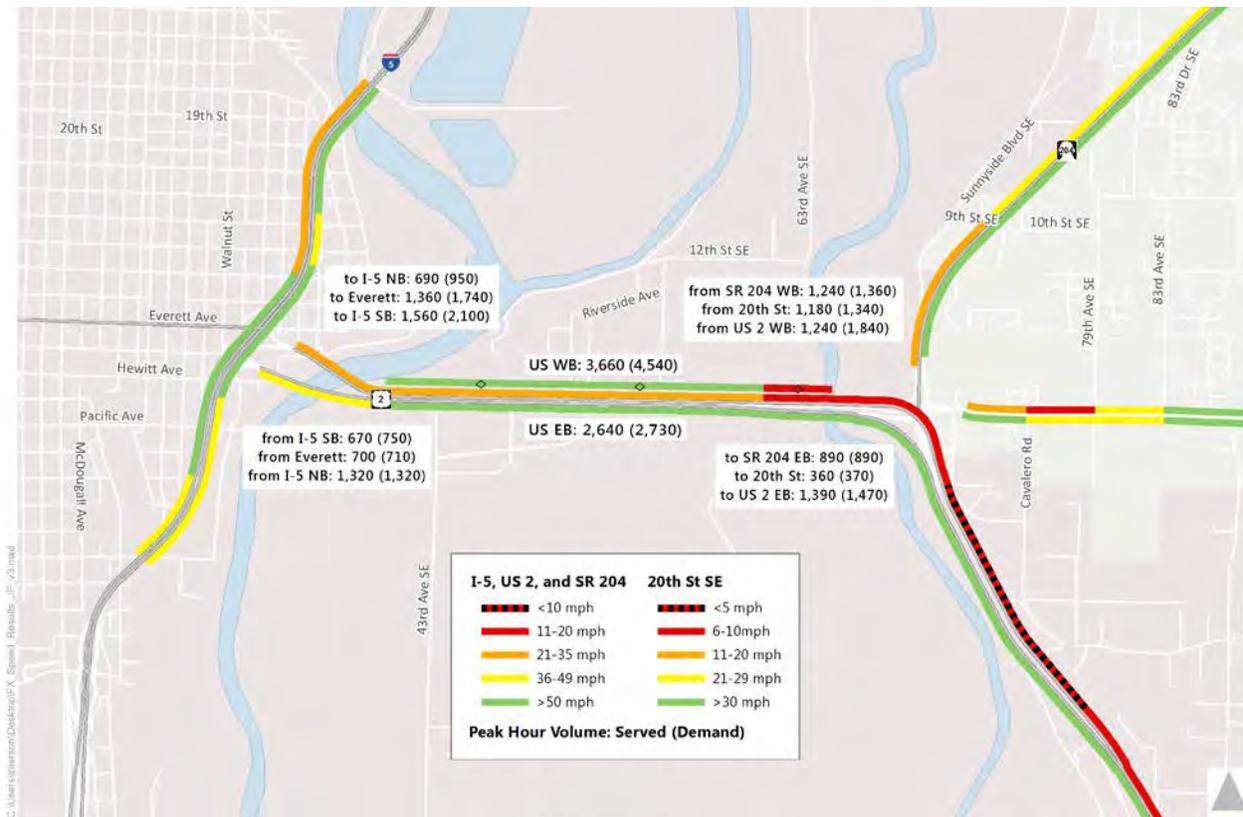
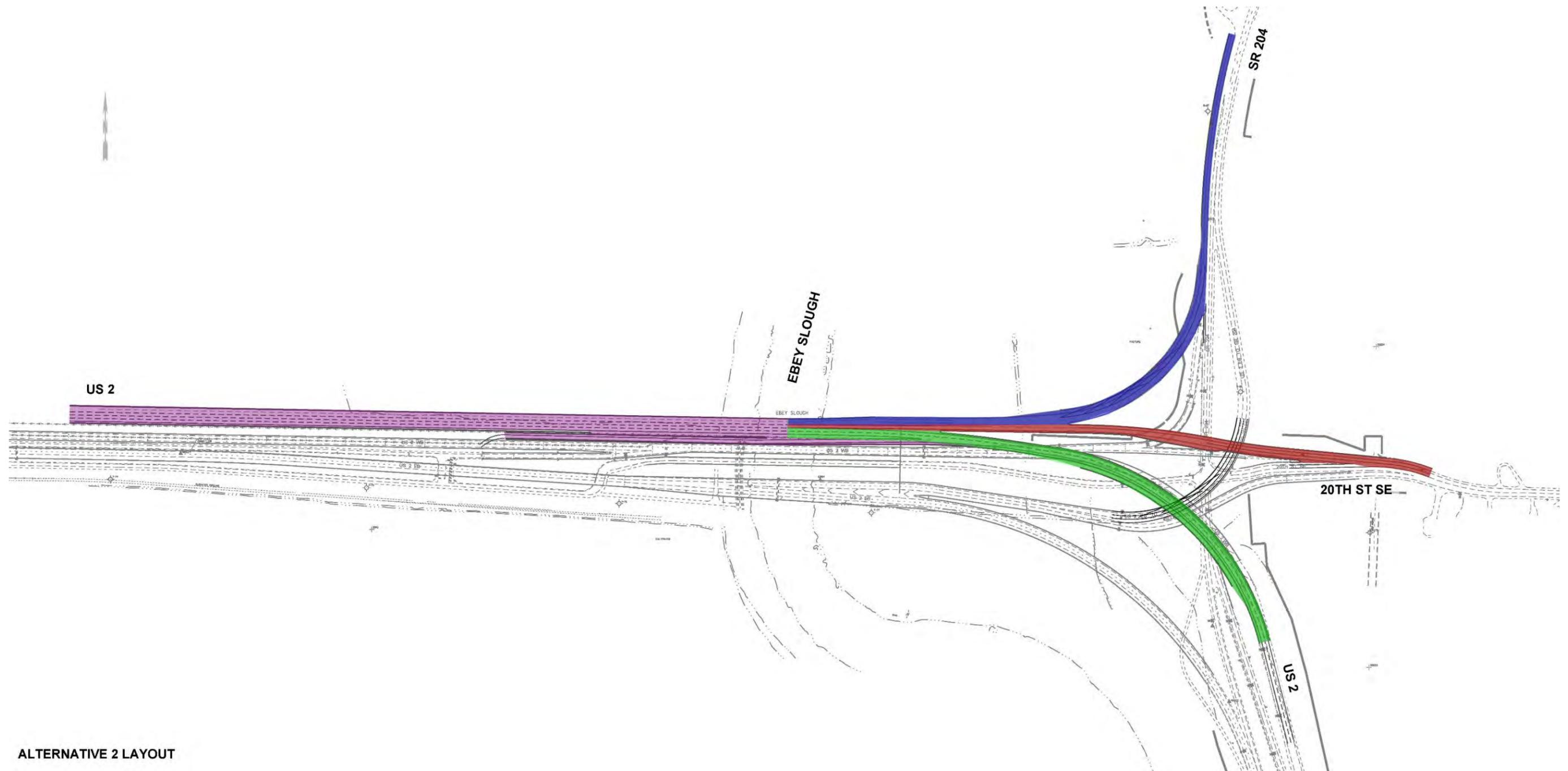


Figure 2-14 Alternative 1 Operations. 2040 AM Peak

Ability to Meet the Needs

Alternative 1 does not fully meet the project need to improve travel time and reliability compared to the No-Build Alternative; travel times improve for SR 204 and 20th Street SE corridors but increase for US 2 WB traffic by about 50 percent over the forecast No-Build travel time. A side-by-side comparison is shown in Figure 2-19 and Figure 2-20. Alternative 1 would improve safety at the study interchange by improving geometrics and removing some merge locations.



ALTERNATIVE 2 LAYOUT

Figure 2-15 Alternative 2 Layout

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Alternative 2

Alternative 2, shown in Figure 2-15 and originally developed as Concept 4, lays out four lanes entering the assumed four-lane WB trestle. This alternative maintains the Ebey Island exit from US 2 WB. SR 204 and 20th Street SE join a two-lane mainline US 2; each add lane is maintained across the trestle.

Alternative 2 Design

The US 2 mainline would be widened to maintain a two-lane configuration through the US 2/SR 204/20th Street SE interchange and onto the westbound trestle.

As in Alternative 1, the SR 204 on-ramp would join the US 2 corridor as an add lane on the right side of the structure.

The 20th Street SE on-ramp was also designed with the same parameters as outlined for Alternative 1.

The Ebey Island off-ramp is kept open; this requires shifting the new westbound trestle north by about 30 feet, incurring additional ROW impacts. The off-ramp to Ebey Island starts east of the US 204 and 20th Street on-ramp / mainline US 2 merge points, causing the off-ramp to be inaccessible to traffic coming from SB 204 and 20th Street. This will also require a barrier between the SR 204 and mainline US 2 past the Ebey Island off-ramp gore, which in turn pushes the start of the HOV lane further west on the trestle.

An HOV lane on the westbound trestle starts about 2,000 feet downstream of the study interchange.

Operational Benefits

Figure 2-16 illustrates corridor speeds for Alternative 2. As can be seen in the figure, congestion from the east end of the study area clears up considerably. However, congestion originating from the downtown Everett and I-5 ramps extends back onto the trestle with speeds of between 15 and 20 mph. Because the HOV lane merges into the congested GP lanes at the west end, it also operates with slower than posted speeds. The HOV lane would still provide a travel time benefit with travel speeds closer to 35 mph. It should be noted that even though there is still congestion in the study area, it is less severe than shown in the No-Build Alternative.

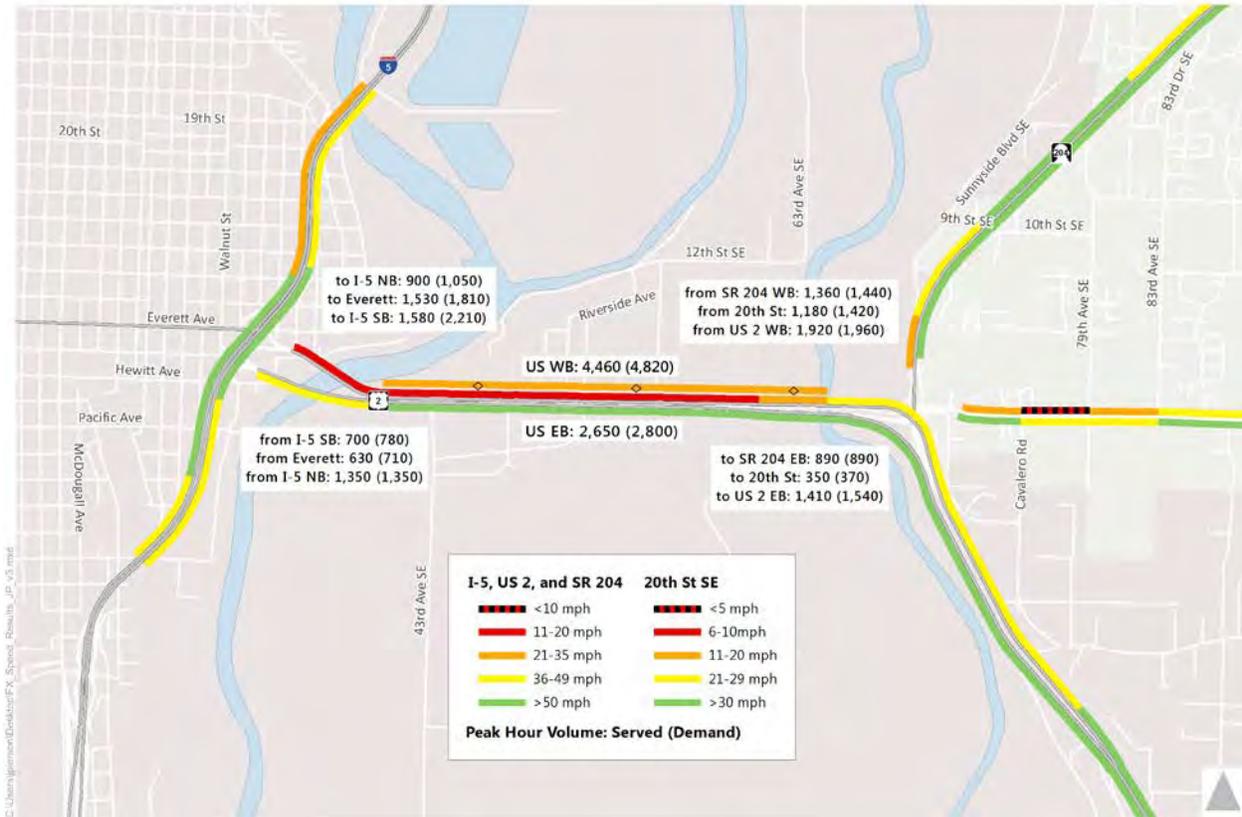


Figure 2-16. Alternative 2 Operations. 2040

Alternative 2 can serve over 1,100 vph more than the No-Build Alternative. The increase in traffic flow is due to the additional lane that was assumed on the US 2 trestle. Westbound travel times for all corridor origins are improved or are similar to the No-Build travel times. Alternative 2 improves the person moving capacity of the corridor by allowing traffic from the east end of the corridor to easily access the HOV lane and bypass congestion that occurs for GP traffic at the I 5/US 2 interchange. The HOV lane also continues to provide additional person carrying capacity that could be more efficiently used.

Ability to Meet the Needs

Alternative 2 demonstrates the potential for improving travel time through all three study corridors – US 2 WB, SR 204, and 20th Street SE. This improved mobility is achievable by improving both the study interchange and the US 2 WB trestle, which was assumed to operate with four lanes. Alternative 2 meets the need to provide improved mobility and safety.



ALTERNATIVE 3 LAYOUT

Figure 2-17 Alternative 3 Layout

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Alternative 3

Alternative 3, shown in Figure 2-17 and originally developed as Concept 5, lays out four lanes entering the assumed four-lane WB trestle. This alternative relocates the Ebey Island exit from US 2 WB to the intersection at SR 204 and 20th Ave SE. Mainline WB US 2 is widened to two lanes. SR 204 and 20th Street SE on-ramps enter as add lanes.

Alternative 3 Design

The US 2 corridor was assumed to be of the same design as described for Alternative 2. The change in design between Alternative 2 and Alternative 3 is that the 20th Street SE ramp is assumed to be braided with the SR 204 ramp. That aligns the 20th Street SE ramp to the outside lane of the US 2 westbound trestle and strategically aligns the local transit service route with the HOV lane.

The westbound SR 204 to westbound US 2 ramp was designed as a single add lane.

20th Street SE on-ramp was designed with the assumption that this corridor could have an HOV lane prior to the construction of this interchange project. The on-ramp begins with two lanes, which merge into a single lane prior to joining the US 2 mainline as an add lane. The on-ramp was designed to allow inclusion of a ramp meter.

This Alternative closes the Ebey Island off-ramp similar to Alternative 1 and uses the same design feature for access mitigation.

An HOV lane on the westbound trestle starts about 2000' downstream of the study interchange.

Operational Benefits

Figure 2-18 illustrates the corridor speeds for Alternative 3. Alternative 3 presents similar operational benefits as described for Alternative 2. Additional benefit is achieved by facilitating access from 20th Street SE to the outside HOV lane on mainline US 2 using the flyover ramp design. Alternative 3 is similar to Alternative 2: it can serve about 1,100 vph more than the No-Build Alternative. The increase in traffic flow is due to the additional lane that was assumed on the US 2 trestle. Westbound travel times for all corridor origins are improved or are similar to the No-Build travel times.

Alternative 3 also improves the person moving capacity of the corridor by allowing traffic from the east end of the corridor to easily access the HOV lane and bypass congestion that occurs for GP traffic at the I-5/US 2 interchange. The HOV lane also continues to provide additional person-carrying capacity.

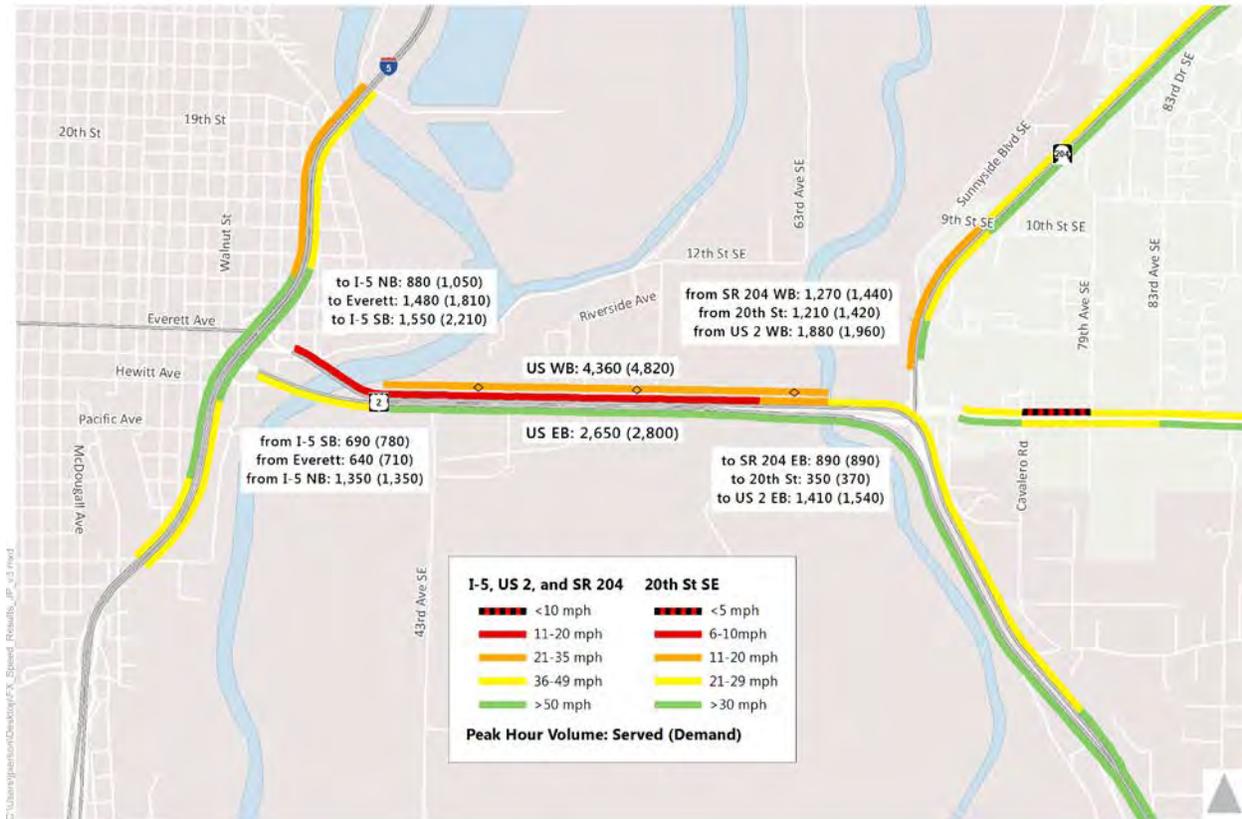


Figure 2-18 Alternative 3 Operations. 2040

Ability to Meet the Needs

Alternative 3 demonstrates the potential for improving travel time through all three study corridors – US 2 WB, SR 204, and 20th Street SE. This improved mobility is achievable by improving both the study interchange and the US 2 WB trestle, which is assumed to operate with four lanes. By improving the geometric configuration and removing some merge locations, safety would also be improved with Alternative 3. Alternative 3 meets the need to provide improved mobility and facilitates integration with a future four-lane US 2 WB trestle configuration.

Alternative Comparison Summary

Key findings of the overall operations were presented to the IJR Support Team. A comparison of travel times through the study areas along three main corridors is illustrated in Figure 2-19 and Figure 2-20, with data in Table 2-3. Alternative 1 provides travel-time benefit for SR 204 and 20th Street SE corridors, but worsens the travel time along US 2 WB for mainline traffic upstream of the US 2/SR 204/20th Street SE interchange (compared to forecast no-build operations). Alternative 2 provides benefit for SR 204 and 20th Street SE corridors, but essentially maintains the expected travel time along the US 2 mainline corridor. Alternative 3 experiences very similar operational benefits to Alternative 2; however, Alternative 3 provides greater travel time benefits for HOV and transit travelers due to the configuration of the 20th Street SE on-ramp and its connection to US 2 WB.



Figure 2-19. Travel Time Comparison – WB



Figure 2-20. Travel Time Comparison - EB

TABLE 2-3. CORRIDOR TRAVEL TIME COMPARISON

		2016 Existing	2040 No-Build	2040 Alt. 1	2040 Alt. 2	2040 Alt. 3
Peak 15-Minute Travel Time (minutes) - All Vehicles						
WB	SR 204 at 81st Ave SE to I-5 at Pacific Ave	13:45	32:00	12:30	15:00	15:40
	20th St SE at 83rd Ave SE to I-5 at Pacific Ave	9:05	28:05	14:25	19:45	17:35
	US 2 at Bickford Ave to I-5 at Pacific Ave	8:05	14:20	22:40	14:25	14:30
EB	I-5 at Pacific Ave to SR 204 at 81st Ave SE	4:55	5:05	5:00	5:00	5:00
	I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	4:55	5:35	5:30	5:35	5:30
	I-5 at Pacific Ave to US 2 at Bickford Ave	4:55	5:00	5:10	5:10	5:10
Peak 15 Minute Travel Time (minutes) - HOV						
WB	SR 204 at 81st Ave SE to I-5 at Pacific Ave	—	32:00	10:40	12:05	13:50
	20th St SE at 83rd Ave SE to I-5 at Pacific Ave	—	28:05	12:15	16:45	13:40
	US 2 at Bickford Ave to I-5 at Pacific Ave	—	14:20	22:25	13:30	13:00
Note: The travel time benefit of each alternative is constrained by the capacity limitations at either end of the corridor. Westbound travel is limited by the receiving ability at the I-5/US 2 interchange and eastbound travel is held upstream by capacity limitations at the same interchange. This is discussed in more detail in Policy Point 3.						

Although all met the goals set forth in Policy Point 1, Alternative 3 (originally Concept 5) was shown to be the most effective design in handling the expected demand in the design year (2040) and it provided the flexibility for enhanced future HOV/transit connectivity at the study interchange and onto the new

westbound US 2 trestle. This was selected as the Preliminary Preferred Alternative (PPA) by the IJR support team at IJR Meeting 5 on December 14, 2017.

2.2.5 Preliminary Preferred Alternative (PPA)

Alternative 3 was selected as the PPA at IJR Support Team Meeting 5, held December 14, 2017; meeting documentation is available in Appendix G. Additional documentation of the alternative comparison process is available as Appendix H, Concept Screening Technical Memorandum. Primary benefits of the alternative include the following:

- Greatest improvement to travel times along the US 2 Corridor
- Improved travel time – all corridors
- Largest potential travel time benefit for HOV
- Facilitates integration of future transit network improvements
- Streamlines HOV / transit access from 20th Street SE to the mainline HOV lane

To achieve the benefit of Alternative 3, it is recommended that any future US 2 westbound trestle improvements allow for four-lane operations (three GP and one HOV lane) during peak period operations.

It is also recommended that additional investigation is conducted into the operations of the US 2/I-5 and downtown Everett interchange; it is apparent based on the analysis conducted for this IJR that the US 2/I-5 and downtown Everett interchange is a cause of congestion onto the US 2 trestle during peak hours.

2.3 FHWA INVOLVEMENT IN ALTERNATIVE CONSIDERATION

The Federal Highway Administration (FHWA) Northwest Region area engineer was included in official IJR Support Team correspondence, including invitations to Support Team meetings and final documents for review.

No additional input was provided from the FHWA. The content of this report has been presented with the intention of addressing all requirements of the FHWA Interstate Access Policy Points Prompt-List¹⁶ to facilitate further FHWA review if necessary. Each chapter lists the FHWA Policy Point prompts in addition to the WSDOT Design Manual Policy Point prompts under the chapter heading.

¹³ Appendix E, Existing Corridor Data Summary Memorandum

¹⁴ WSDOT Northwest Region, "US 2: Everett Port/Naval Station to SR 9 Corridor Planning Study" (2016)

¹⁵ US 2 CPS

¹⁶ "Prompt-List for Reviewing Interstate Access Requests", FHWA, 2010,
https://www.fhwa.dot.gov/modiv/programs/intersta/docs/FHWA_Policy_Points_Promptlist.pdf

POLICY POINT 3. OPERATIONAL AND CRASH ANALYSIS

How will the proposal affect safety and traffic operations at year of opening and design year?

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

3.1 SUMMARY

An operational and safety analysis was conducted to define the existing conditions and establish a future baseline for opening and design year comparison between no-build and Preliminary Preferred Alternative scenarios. The Preliminary Preferred Alternative was then analyzed using both opening year (2025) and design year (2040) volumes and network assumptions.

Key assumptions for analysis included the following:

- Both the opening year (2025) and design year (2040) land use assumptions are consistent with regional and/or local assumptions.
- Some modifications to traffic forecasts were made to reflect a difference in projected local land use. Adjustments to assumed local land use are consistent with the most recent planning efforts by the City of Everett, but they have not yet been incorporated in the regional planning model.
- One lane of the future 2040 WB US 2 trestle would be configured as an HOV lane.
- The intersection of SR 204 and 20th Street SE would be signalized. Further study of signal warrants would be concluded during the design phase of the project.
- 20th Street SE would operate with a five-lane cross-section with no HOV lane configuration. However, the final cross section of 20th Street SE is likely to include a WB HOV lane during PM peak periods.

During the opening year (2025), the US 2 WB trestle would not be reconstructed by the year 2025 and would operate with two lanes WB just as existing conditions.

During the design year (2040), the US 2 WB trestle will have been replaced with a wider structure capable of supporting four-lane operations during the peak hour, assuming re-striping of a 3-lane structure and leaving minimal widths for shoulders.

Primary operational benefits include the following:

- Travel-time savings for WB travelers during the AM peak.
- Reduction of WB congestion along SR 204, 20th Street SE, and US 2 upstream of the study interchange.
- Improved mobility of people and vehicles.
- Improved connectivity for pedestrians and cyclists through the interchange.
- Improved opportunity for transit and HOV to connect with a future US 2 trestle HOV lane.
- Improved connectivity for future transit access to a future light rail station in Everett (via 20th Street on-ramp alignment with mainline US 2 HOV lane)

Operational analysis also reveals that the interchange improvements would improve traffic operations on the east side of the US 2 trestle, but would relocate some of the congestion to the west end of the trestle at the I 5/US 2 interchange. Additional study and coordination would be required to determine how to best improve connectivity at the I-5/US 2 interchange to improve mobility.

3.2 TRAFFIC VOLUMES AND OPERATIONS

This section documents the validation of the design traffic volume and describes the results of the operational analysis of the existing condition as well as no-build and preliminary preferred alternatives in the opening year and design year. Results of the historical collision trends are presented, followed by an analysis of the safety performance of no-build and preliminary preferred alternative.

3.2.1 Travel Demand Model Validation

The Snohomish County travel demand EMME model was used to forecast future traffic demand on the opening year and design year transportation network. The travel demand model's original year 2012 baseline was updated with year 2016 population and employment statistics that were received from Snohomish County and municipal planning staff. The year 2016 land use input is outlined in Table 1-1.

To validate the travel demand model against existing conditions, the project team compared model output with existing traffic volumes at two locations. One location was just east of the US 2/SR 204/20th Street SE interchange and included all three approaches; the other was just west of the study interchange capturing traffic on US 2 between I-5 and Ebey Island off-/on-ramps. Existing traffic count data was collected in November 2016 and compared with the travel demand model output. The travel demand model was considered as validated when traffic volumes at the screen lines were within 10 percent of the observed data.

The travel demand model was updated to include future transportation network capacity projects that were agreed to by the IJR Support team members and documented in the US 2/SR 204/20th Street SE Methods and Assumptions memo. The travel demand model was then used to forecast changes in travel

demand through the study area for the opening and design years. Travel demand model forecast growth was then applied to existing traffic volumes to forecast future volumes for use in the operational analysis. The demand model validation is discussed in more detail in Appendix I.

3.2.2 Traffic Volumes

The demand at the study interchange, as forecast for opening year 2025 and design year 2040, is shown in Table 3-1. Note that these volumes reflect the anticipated demand on each segment, rather than vehicle throughput on the segment. For example, a roadway segment might have enough capacity to serve 2000 vehicles per hour, but the demand might be 2,500 vehicles per hour. This condition would result in congestion. Traffic volume forecasts focus on the demand so that the project team can understand where congestion conditions might be resolved or appear based on future changes in land use. This data set provides a high-level view of future traffic growth in the study area. The forecast traffic volumes were used in traffic operations analysis as described in the next section of this policy point.

TABLE 3-1 PEAK HOUR DEMAND VOLUMES THROUGH US 2/SR 204/20TH ST SE INTERCHANGE

	Existing		No-Build 2025		No-Build 2040		PPA 2025		PPA 2040	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB										
From SR 204	750	680	780	720	1,260	730	780	720	1,440	760
From 20th St SE	930	510	980	550	1,340	840	980	550	1,420	870
US 2 through	1,510	1,010	1,540	1,070	1,940	1,500	1,540	1,070	1,960	1,580
<i>Total</i>	<i>3,190</i>	<i>2,200</i>	<i>3,300</i>	<i>2,340</i>	<i>4,540</i>	<i>3,070</i>	<i>3,300</i>	<i>2,340</i>	<i>4,820</i>	<i>3,210</i>
US 2 EB										
To SR 204	390	1,810	420	1,860	890	1,900	420	1,860	890	2,000
To 20th St SE	280	1,070	310	1,160	370	1,420	310	1,160	370	1,370
US 2 through	1,020	1,370	1,140	1,520	1,470	1,810	1,140	1,520	1,540	1,800
<i>Total</i>	<i>1,690</i>	<i>4,250</i>	<i>1,870</i>	<i>4,540</i>	<i>2,730</i>	<i>5,130</i>	<i>1,870</i>	<i>4,540</i>	<i>2,800</i>	<i>5,170</i>

Future traffic volumes on the US 2 corridor are forecast to maintain a peak direction of traffic with most traffic traveling WB during the morning peak and EB during the evening peak. Both the peak direction and off-peak direction of travel show growth between existing conditions and a future no-build condition. Total WB traffic growth is over 40 percent on the trestle during the morning peak, while the EB traffic growth is higher at about 59 percent. Construction of the Preliminary Preferred Alternative would result in some additional traffic demand because the Preliminary Preferred Alternative introduces new roadway capacity that may present a more attractive route option for users. For example, instead of traveling through Marysville, some might choose to use the US 2 corridor to access I-5 or downtown Everett. The increase in traffic represents a re-distribution of trips from other corridors to use the increased capacity on the corridor.

3.3 TRAFFIC OPERATIONAL ANALYSIS

Traffic operations analysis was conducted using the industry standard Vissim model version 8.0. The Vissim 8.0 is used to simulate traffic operations based on defined model parameters, including roadway geometrics combined with existing or future traffic volume data. Similar to the travel demand forecasting exercise, the traffic operations analysis models must be calibrated to existing conditions to ensure the model can assess field conditions. Then, if it has issues, the project team can understand how to post-process the data to compare alternative operations. Model results were compared to field-collected traffic volume data, key travel times, and queueing observation data. Additional information regarding the model calibration process and findings can be found in the Methods and Assumptions Memo in Appendix A.

3.3.1 Existing Condition Validation (2016)

The existing corridor configuration as described in section 2.2.4 is summarized in Figure 3-2. Analysis of the existing conditions focused primarily on average speed and travel time. The speeds were derived from the Vissim traffic simulation model, which was validated against traffic counts and travel time surveys conducted within the study area. Figure 3-1 shows the posted speed limits within the study area to provide a frame of reference.

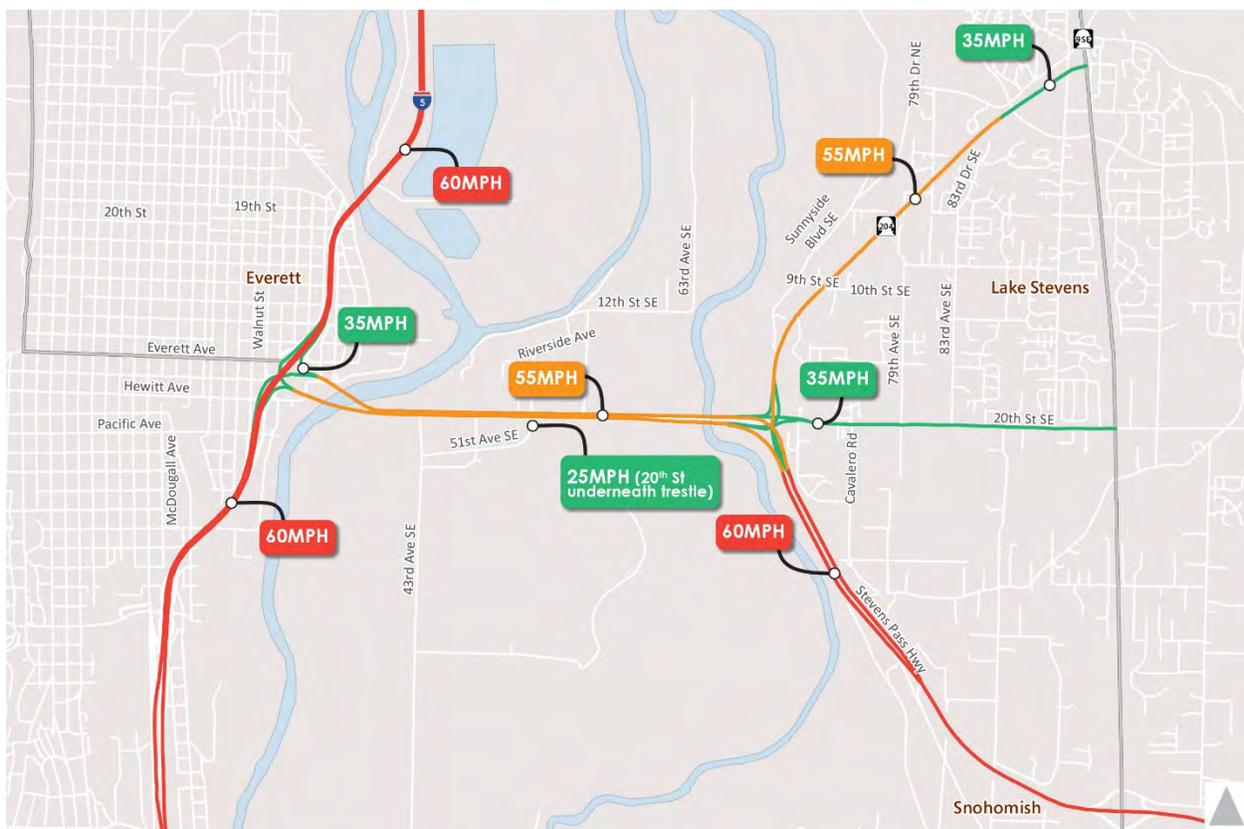


Figure 3-1. Existing Conditions — Posted Speeds

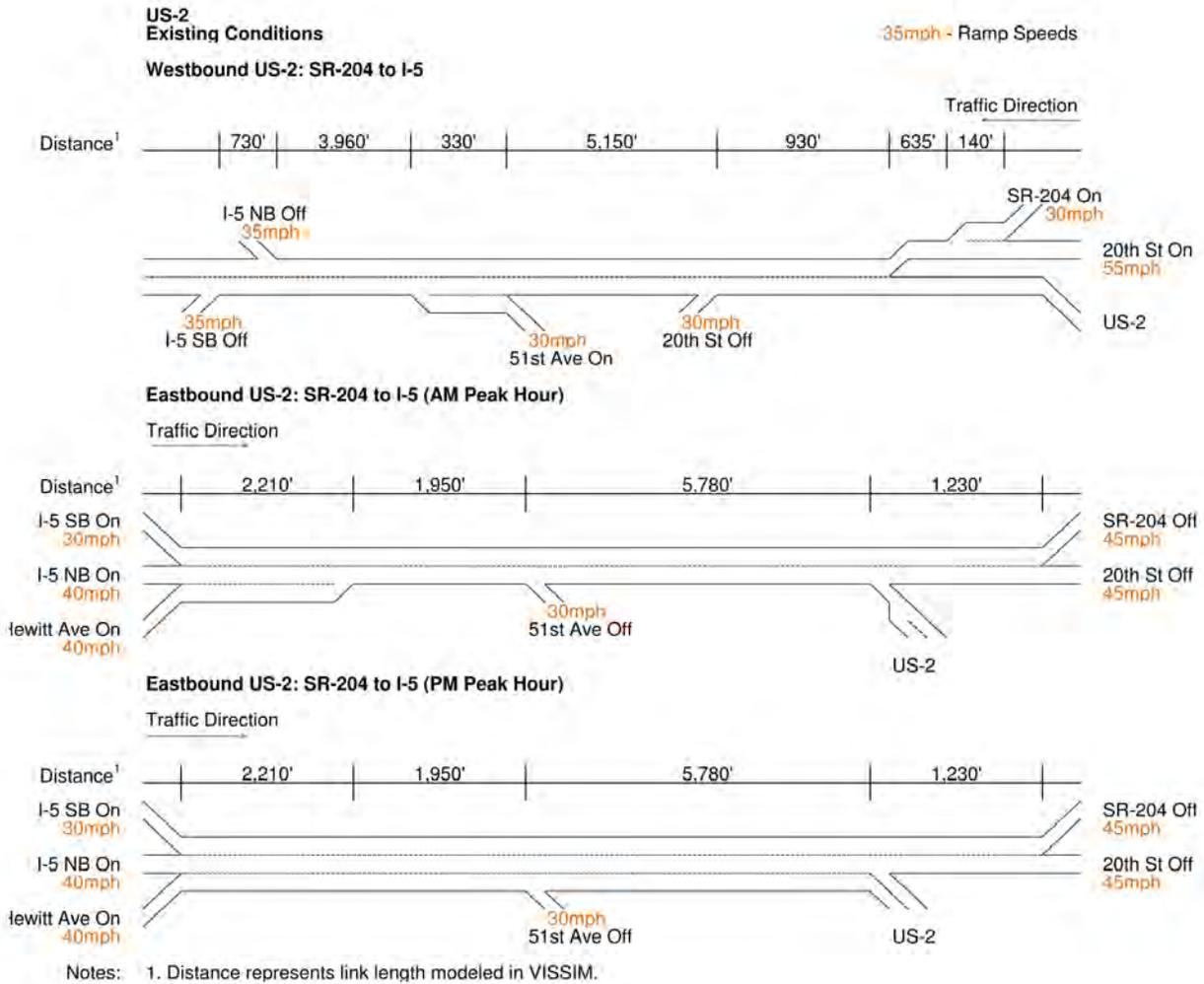


Figure 3-2. Existing Conditions Traffic Configuration

Existing Traffic Operations

To conceptualize the network experience through the study area, three “corridors” were distinguished for each of the three groups of travelers through this interchange: those originating on SR 204, those originating on 20th Street SE, and those who enter the study area on mainline US 2 as through traffic. The predominant flow of traffic along this route is toward I-5 SB, so a point on I-5 at Pacific Avenue was chosen as the corridor endpoint. All three corridors terminate at the same location to provide a means of comparison between the three locations upstream of the US 2/SR 204/20th Street SE interchange.

Traffic demand at the study interchange is highest for WB traffic during the AM peak hour. The primary demand flow is westward in the mornings and eastward in the afternoons. Current operations present severe congestion for WB traffic in the mornings, especially for those entering US 2 from SR 204. The travel time for those using SR 204 to access US 2 WB is about 150 percent of the travel time via 20th Street SE. This illustrates the disadvantage of SR 204 traffic attempting to merge with 20th Street SE traffic prior to entering US 2. Travel times for through traffic and 20th Street SE traffic are comparable, with those

along mainline US 2 experiencing lower travel time due to higher speeds than those on the surface street. EB traffic experiences no delay through the corridors during the AM peak.

Instead of an equal-but-opposite flow in the afternoon, the PM peak demand at the study interchange is much lower than the AM peak. This is due to EB traffic being constrained on I-5 upstream of the I-5/US 2 interchange. Although they will still experience severe congestion along I-5 between Pacific Avenue and US 2, the traffic destined for SR 204 in the afternoon will experience travel times about half the duration of their morning commute through the corridor.

Average travel times collected by a study vehicle making multiple runs during peak hours of a regular weekday are outlined in Table 3-2, as well as corresponding average travel speed.

TABLE 3-2. EXISTING (2016) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	13:45	19
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	9:05	25
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:05	30
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	4:55	51
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	4:55	45
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	4:55	55
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:00	51
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:00	45
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	4:25	55
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	7:00	36
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	6:50	32
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:15	43

Traffic on WB SR 204 and 20th Street SE approaching the interchange merge location experience speeds less than 20 miles per hour. Speeds on US 2 also slow after the lane drop west of the Bickford Avenue on-ramp. Once on the trestle, traffic generally flows faster than 35 miles per hour, although speeds were observed much slower on certain days due to congestion on I-5 or other downstream constraints.

In the PM peak hour, EB traffic flows smoothly, with some slowdowns approaching the diverge from US 2 to SR 204/20th St SE. Heavy volumes on the SR 204 EB off-ramp create slowdowns on the ramp and at the intersection at Sunnyside Boulevard SE.

Freeway Operations

Existing freeway operations were analyzed in Vissim using the volume and travel time data collected. Output from Vissim delivers a baseline to quantify existing conditions for comparison with the future no-build and build scenarios. The existing operations metrics are summarized in Table 3-4.

WSDOT has established operating criteria for all highways of statewide significance. This level of service (LOS) requirement is measured on an alphabetical scale from A to F, with A being the highest LOS and therefore the safest and most comfortable for roadway users. Each letter represents the ability of an element of the infrastructure to meet the traffic demand; on freeways, this is determined using vehicle density (defined in Table 3-3). Analysis of the existing traffic conditions revealed that the existing network is failing in several key locations.

TABLE 3-3. LOS CRITERIA (URBAN FREEWAYS)

LOS	Descriptor	Density (VPLPM)
A	Free Flow	0–11
B	Reasonably Free Flow	>11–18
C	Stable Flow	>18–26
D	Approaching Unstable Flow	>26–35
E	Unstable Flow	>35–45
F	Forced Flow	>45 or demand exceeds capacity
Source: Highway Capacity Manual		

The established LOS operating standard for US 2 is D. During the AM peak, WB US 2 fails service criteria throughout the entire study area; at no point in the study area during the morning peak hour do traffic operations on US 2 WB improve over LOS E.

SB I-5 also operates at LOS E and F in the area surrounding the US 2/I-5 interchange. The extent of the failing I-5 segments is unknown; this study does not address the US 2/I-5 interchange beyond the impact observed on the US 2/SR 204/20th Street SE interchange.

During the PM peak, WB US 2 operates well within acceptable operating criteria. The existing merge of 20th Street SE and SR 204 is failing at LOS E; EB US 2 also is failing at LOS E and F just upstream of the SR 204/20th Street SE off-ramp. NB I-5 operates at LOS F in vicinity of the I 5/US 2 interchange.

This study did not evaluate the full extent of congestion on I-5; impacts on the US 2/I-5 interchange as a result of changes to the US 2/SR 204/20th Street SE interchange were evaluated.

The existing congestion conditions are illustrated in Figure 3-3 and Figure 3-4.

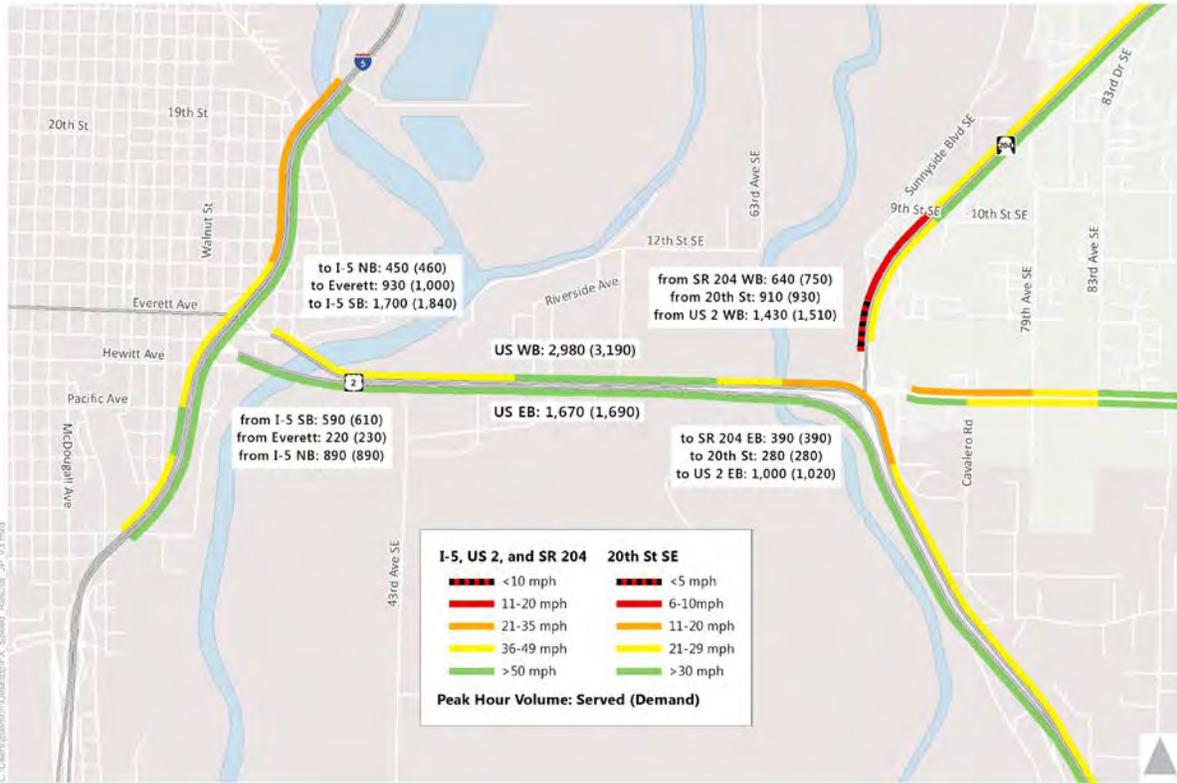


Figure 3-3. Existing (2016) Speeds – AM

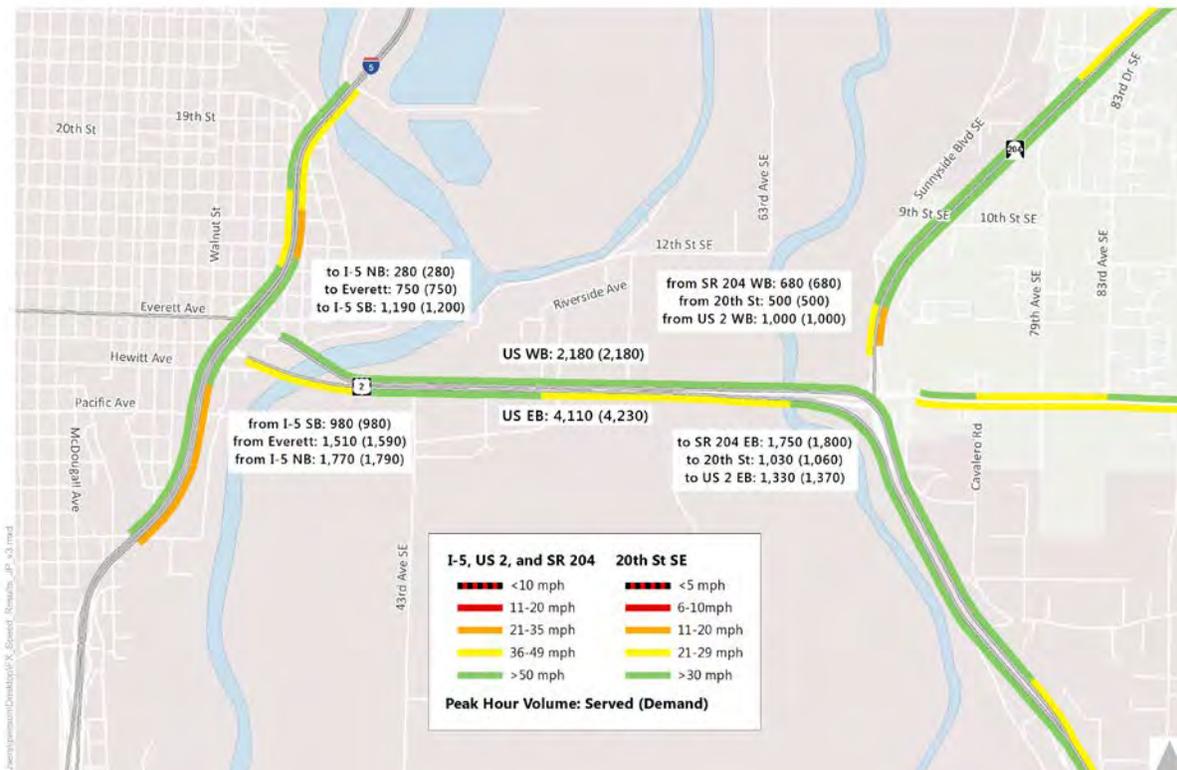


Figure 3-4. Existing (2016) Speeds – PM

TABLE 3-4. EXISTING (2016) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	B	B	19	16	48	51	10	10
US 2 WB: SR 204 EB Off-ramp	Diverge	F	B	95	19	17	53	10	0
US 2 WB: SR 204 WB/20th St On-ramp to 20th St Off-ramp	Weave	D	C	33	25	45	47	210	20
US 2 WB: 20th St Off-ramp to Ebey Island On-ramp	Basic	D	C	28	20	53	57	0	0
US 2 WB: Ebey Island On-ramp	Merge	D	C	34	20	48	58	20	10
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	E	C	40	22	43	56	0	0
US 2 WB: I-5 NB On-ramp	Diverge	E	C	36	23	46	55	0	0
US 2 WB: I-5 SB On-ramp	Diverge	D	C	33	21	48	56	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	B	D	14	33	50	44	40	110
US 2 EB: Ebey Island Off-ramp	Diverge	B	D	16	30	55	50	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	B	E	15	39	55	45	0	10
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	B	F	19	53	53	32	0	10
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	11	13	56	55	0	10
US 2 EB: SR 204 WB On-ramp	Merge	B	B	11	13	54	54	40	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	A	B	10	13	58	58	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	10	14	58	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	C	F	24	83	52	24	0	170
I-5 NB: US 2 EB Off-ramp	Diverge	B	F	18	71	52	33	0	20
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	B	C	15	19	56	53	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	B	E	20	38	52	37	30	10
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	C	51	27	31	49	280	0
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	C	29	21	52	57	10	10
I-5 SB: US 2 WB On-ramp	Merge	D	C	33	23	51	60	150	10
I-5 SB: Pacific Ave On-ramp	Merge	E	D	35	32	46	45	10	40

Operations at Crossroad Intersections

The local roadway network at the study interchange consists of the intersection of SR 204 and 20th Street SE directly below the interchange; there are several intersections along 20th Street SE east of the interchange, and several minor non-signalized intersections along SR 204. As shown in Table 3-5, the intersections currently operate at acceptable levels of service except for the Cavalero Road intersection, which experiences long delays in the AM peak, and Sunnyside Boulevard, which experiences severe delays in the AM peak and also operates poorly in the afternoon.

TABLE 3-5. EXISTING (2016) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (s/veh)	
		AM	PM	AM	PM
SR204/20th St SE	All-way stop	A	D	10	34
SR 204/Sunnyside	Side-street stop	F	E	481	35
SR 204/9th	Side-street stop	B	A	15	10
Cavalero/20th St SE	Signal	E	B	62	20
51st Ave SE/US 2 WB ramps	All-way stop	A	A	5	3
51st Ave SE/US 2 EB ramps	All-way stop	A	B	9	12
79th Ave SE/20th St SE	Signal	D	B	53	12
83rd Ave SE/20th St SE	Signal	D	B	39	12
91st Ave SE/20th St SE	Signal	A	B	9	11

Note: LOS at intersections is determined using average vehicle delay. See Appendix D for details.

Intersection queues were reported by Vissim for average, minimum and maximum values. The following results identify the effects of the maximum queue length values for intersection approaches.

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Westbound queues are also evident along 20th Street SE but generally do not extend through the upstream intersection.

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE: NB left turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Turning movement counts at each intersection are presented in Figure 3-5. Additional detail regarding intersection analysis is presented in Appendix D.

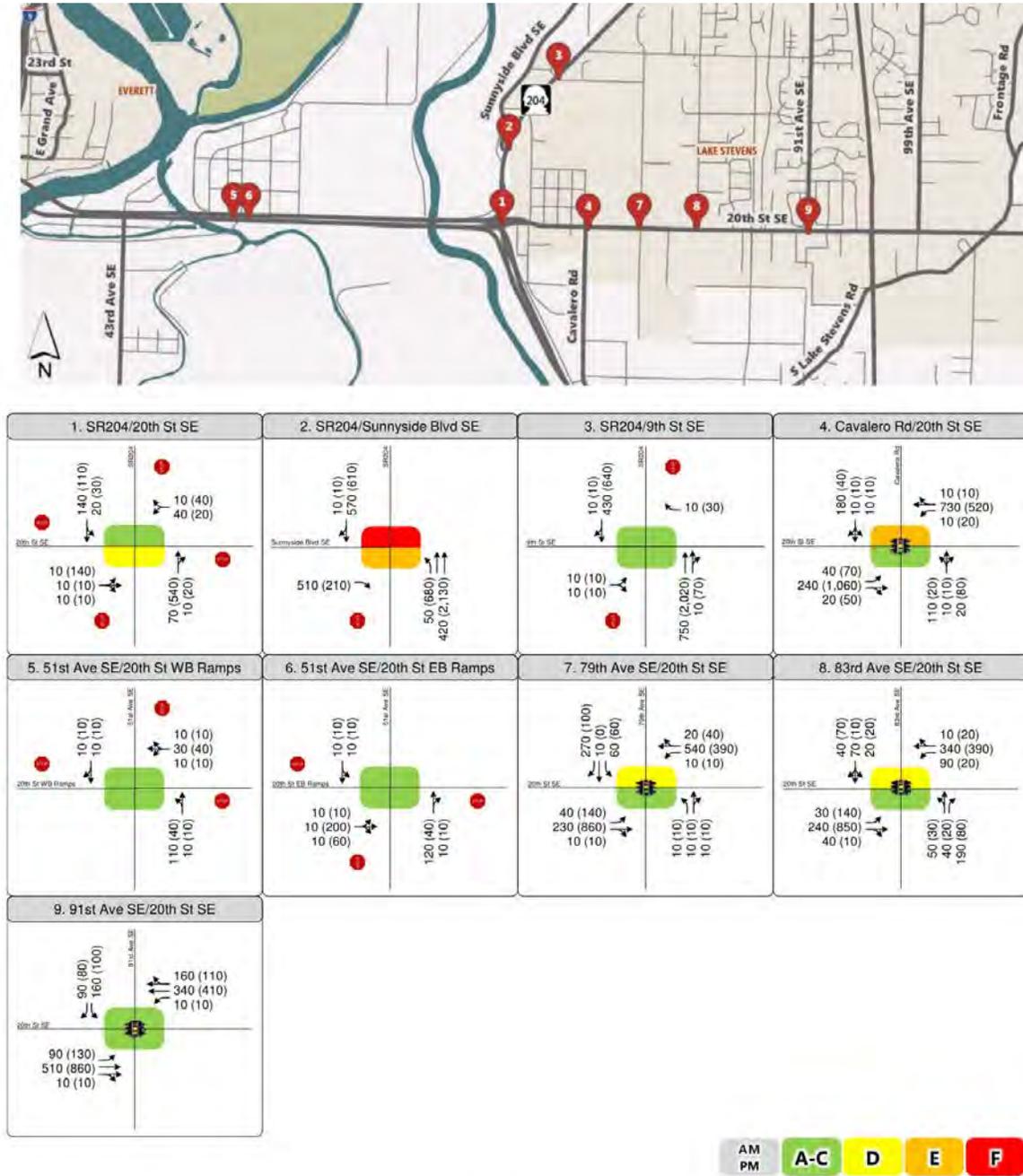


Figure X
Peak Hour Traffic Volumes and Lane Geometries - AM (PM)
Existing Conditions

Figure 3-5. Existing (2016) Intersection Turning Movements

3.3.2 No-Build Analysis

Opening Year (2025)

For this analysis, the traffic configuration along US 2 through the study area for the forecast year 2025 remains the same as existing conditions. See Figure 3-1 and Figure 3-2.

Corridor Operations

The existing network was analyzed with forecast traffic volumes for the opening year to establish a baseline for comparison of the PPA. During the AM peak, the Vissim simulation showed an expected increase in travel time for vehicles through the WB SR 204 corridor compared to existing conditions; WB travel times through the 20th Street SE corridor will increase by almost 30 percent, while WB travel times along US 2 mainline will increase by 6 percent. Travel times will remain similar to existing conditions (within 10 percent) for all PM peak hour traffic and EB traffic in the AM peak. Table 3-6 summarizes the forecast no-build corridor operations.

TABLE 3-6. NO-BUILD (2025) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	17:20	15
From 20th Street SE at 83rd Ave SE to I-5 at Pacific Ave	WB	12:05	18
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:30	29
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:20	48
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	5:30	40
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:20	50
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:25	48
From 20th Street SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:05	44
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	5:00	49
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	6:55	36
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	7:25	30
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:35	41

Review of the forecast 2025 speeds shows a similar level of congestion to existing conditions. Figure 3-6 and Figure 3-7 present the No-Build operations.

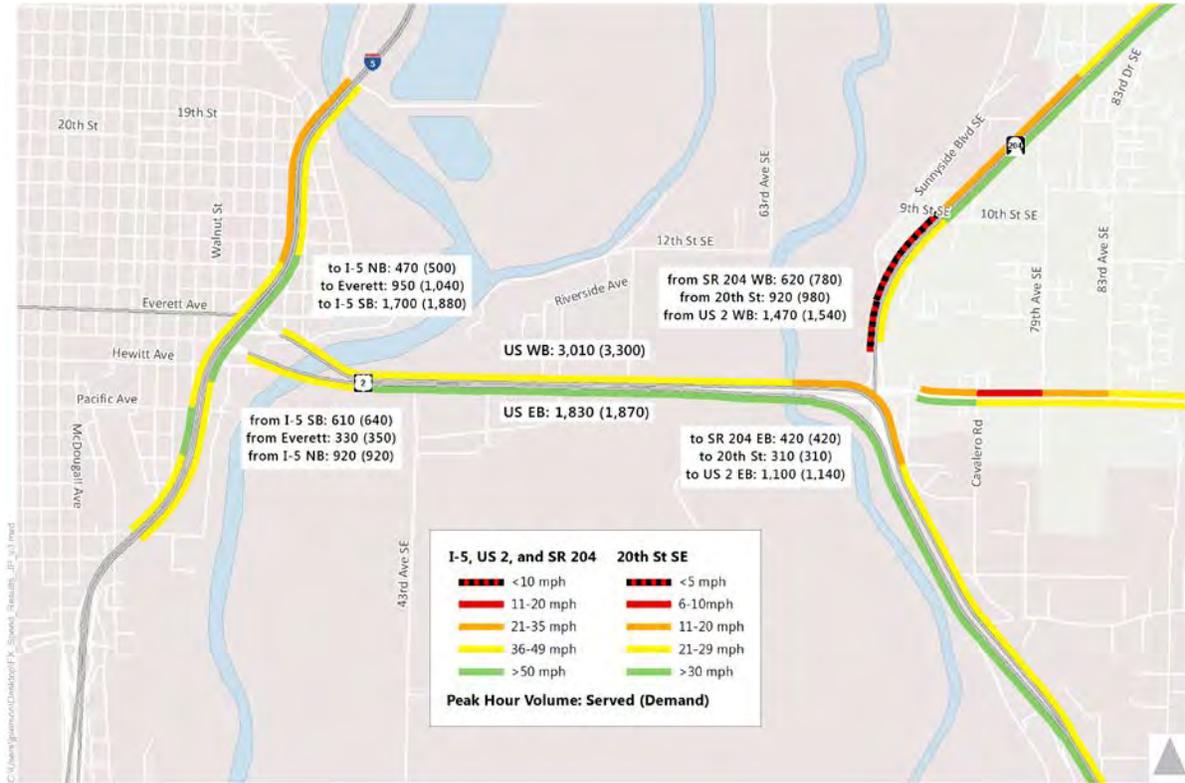


Figure 3-6. No-Build (2025) Speed Diagram – AM

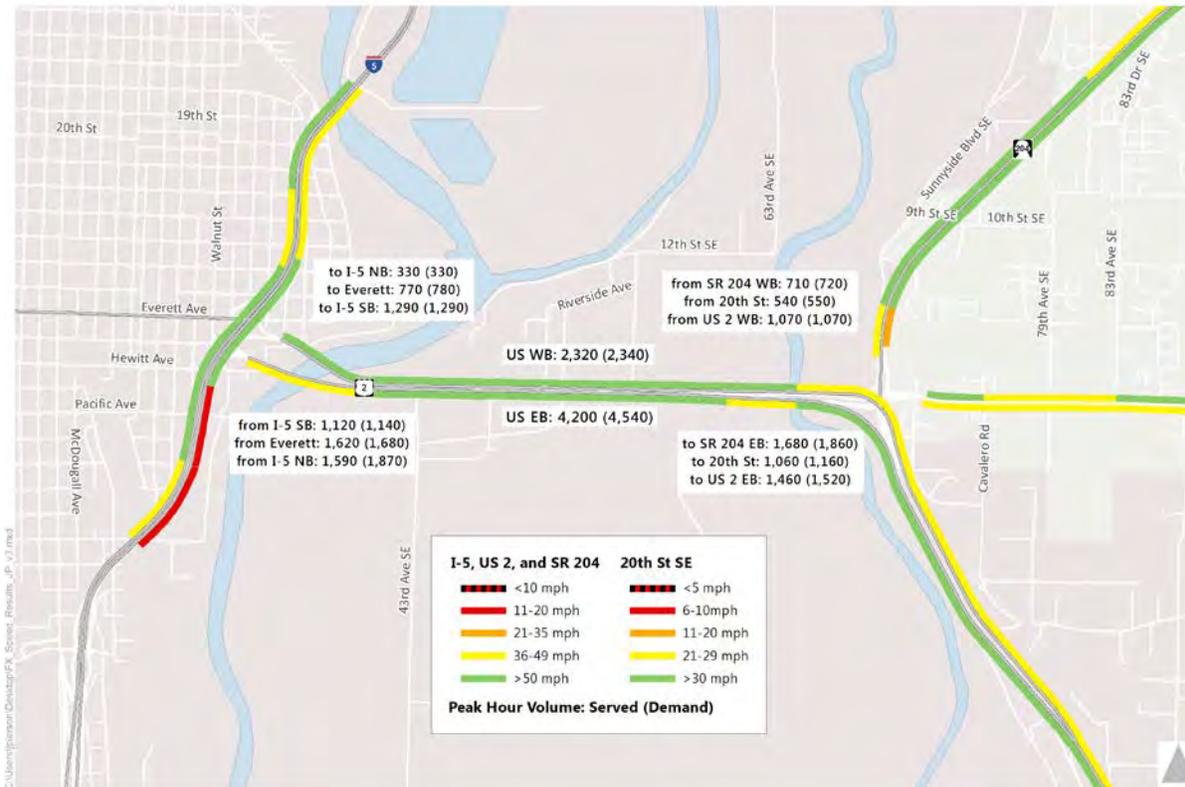


Figure 3-7. No-Build (2025) Speed Diagram – PM

Freeway Operations

The freeway LOS results are relatively consistent between the 2016 Existing and 2025 No Build scenarios. On westbound US 2 during the AM peak hour, the LOS at the Bickford Ave on-ramp merge section degrades from LOS B to LOS F as a result of higher demand volumes and the queue extending further back from the SR 204 eastbound off-ramp. The merge section after the 20th Street on-ramp also changes from operating at LOS D in 2016 to forecasted operations of LOS F in 2025 with increased demand on that on-ramp. On eastbound US 2 during the PM peak hour, the merge section from the I-5 and Hewitt Avenue on-ramp is forecasted to operate at LOS D in 2025 due to increased demand on US 2 from downtown Everett. After this merge section, the segment LOS is consistent with 2016 Existing conditions as illustrated in Figure 3-6. Table 3-7 summarizes the Freeway operations for the No-Build opening year scenario.

Operations at Crossroad Intersections

From 2016 to 2025, local network operations are expected to degrade at all intersections along 20th Street SE approaching the study interchange during the AM peak hour (Table 3-8). This is a result of queueing extending further along local roads as the US 2/SR 204/20th Street SE interchange has already reached capacity and is unable to accommodate the additional demand. Figure 3-8 depicts the congestion queues. Operations in the PM peak are similar to existing conditions.

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE: EB queue on Sunnyside Blvd turning right onto SR 204 20th Street SE/Cavalero Road; WB extends to 79th Ave SE
- 20th Street SE/79th Ave SE: SB approach on 79th Ave SE
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Westbound queues are also evident along 20th Street SE to the east of 79th Ave SE but generally do not extend through the upstream intersection. For many of the cross streets, the queues are caused by the high traffic demand for WB travel on 20th Street SE, creating less signal green time for the cross-street volumes

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE- Northbound left turn exceeds pocket length
- 20th Street SE/79th Ave SE- Southbound left turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Additional detail regarding intersection analysis is available in Appendix D.

TABLE 3-7. NO-BUILD (2025) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	F	B	56	19	28	46	10	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	D	120	30	9	35	20	0
US 2 WB: SR 204 WB/20th Street On-ramp to 20th St Off-ramp	Weave	D	C	33	28	43	45	260	20
US 2 WB: 20th St Off-ramp to Ebey Island On-ramp	Basic	D	C	35	21	46	57	0	0
US 2 WB: Ebey Island On-ramp	Merge	F	C	50	27	36	55	20	0
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	E	C	42	22	45	57	0	0
US 2 WB: I-5 NB On-ramp	Diverge	D	C	34	22	50	57	0	0
US 2 WB: I-5 SB On-ramp	Diverge	D	C	31	25	51	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	D	E	32	41	47	36	40	370
US 2 EB: Ebey Island Off-ramp	Diverge	C	C	26	27	40	54	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	B	D	17	26	54	54	0	0
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	E	21	39	53	41	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	C	B	21	14	45	53	150	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	15	51	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	12	13	50	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	F	40	112	39	17	0	1,050
I-5 NB: US 2 EB Off-ramp	Diverge	C	F	22	97	50	19	0	10
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	E	C	38	18	43	51	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	D	31	30	43	41	20	100
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	D	51	30	31	47	460	30
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	C	32	22	47	56	10	0
I-5 SB: US 2 WB On-ramp	Merge	D	C	31	24	53	59	180	0
I-5 SB: Pacific Ave On-ramp	Merge	E	E	37	39	44	41	0	20

TABLE 3-8. NO-BUILD (2025) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (s/veh)	
		AM	PM	AM	PM
SR 204 / 20th St SE	All-way stop	C	E	25	42
SR 204 / Sunnyside Blvd SE	Side-street stop	F	D	496	31
SR 204 / 9th St SE	Side-street stop	F	B	103	13
Cavalero Rd /20th St SE	Signal	E	C	64	22
51st Ave SE / US 2 WB On-ramp	All-way stop	A	A	5	4
51st Ave SE / US 2 EB Off-ramp	All-way stop	A	B	10	12
79th Ave SE / 20th St SE	Signal	E	B	73	17
83rd Ave SE / 20th St SE	Signal	F	B	92	13
91st Ave SE / 20th St SE	Signal	C	C	20	27

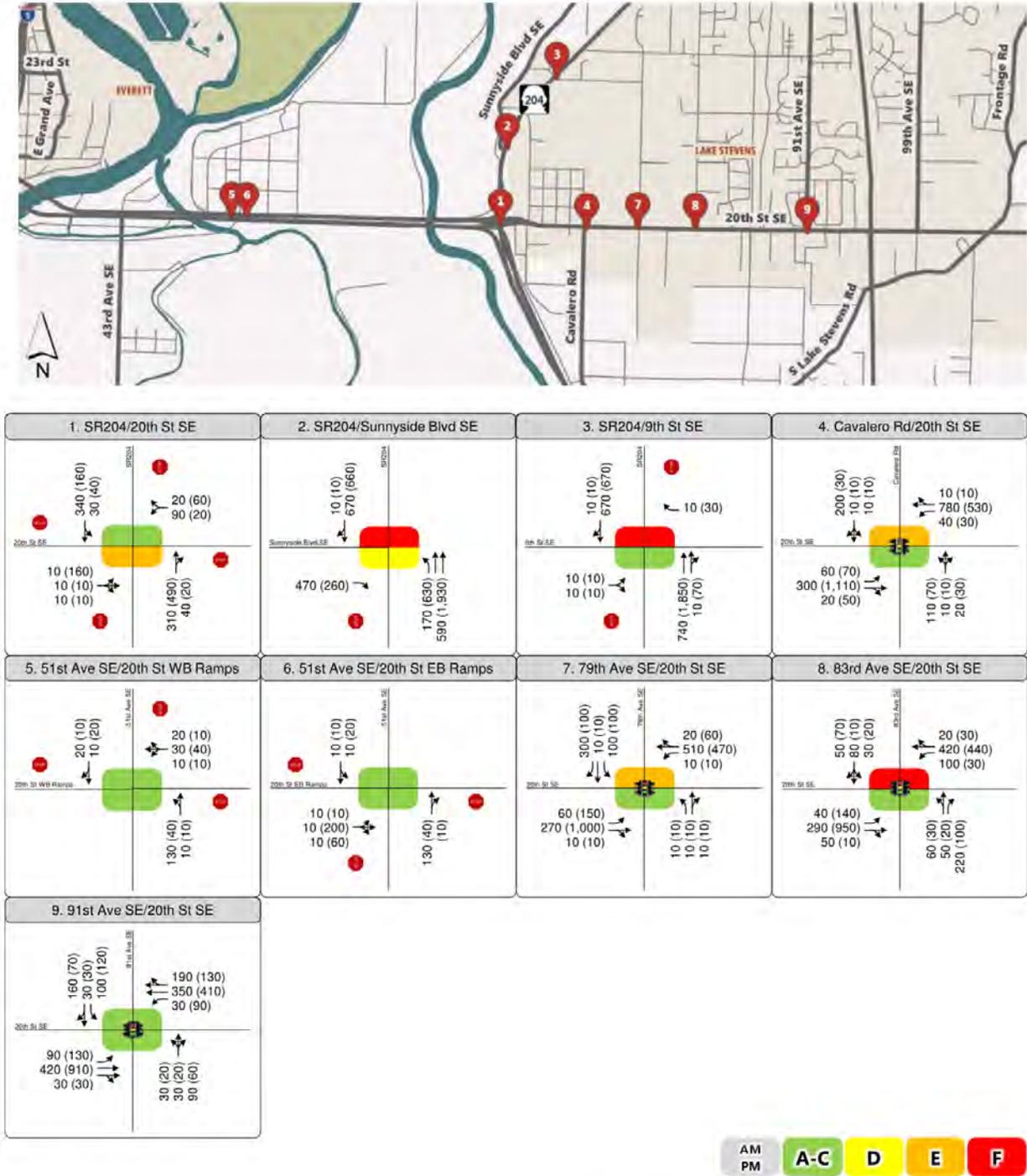


Figure 3-8. No-Build (2025) Intersection Turning Movements
Peak Hour Traffic Volumes and Lane Configurations - AM (PM)
2025 No Build Conditions

Figure 3-8. No-Build (2025) Intersection Turning Movements

Design Year (2040)

The no-build model for 2040 assumes that the westbound US 2 trestle will have been replaced with a wider structure operating with a three-lane configuration including two GP lanes and one HOV lane. Mainline US 2 remains a single lane upstream of the study interchange (see Figure 3-9).

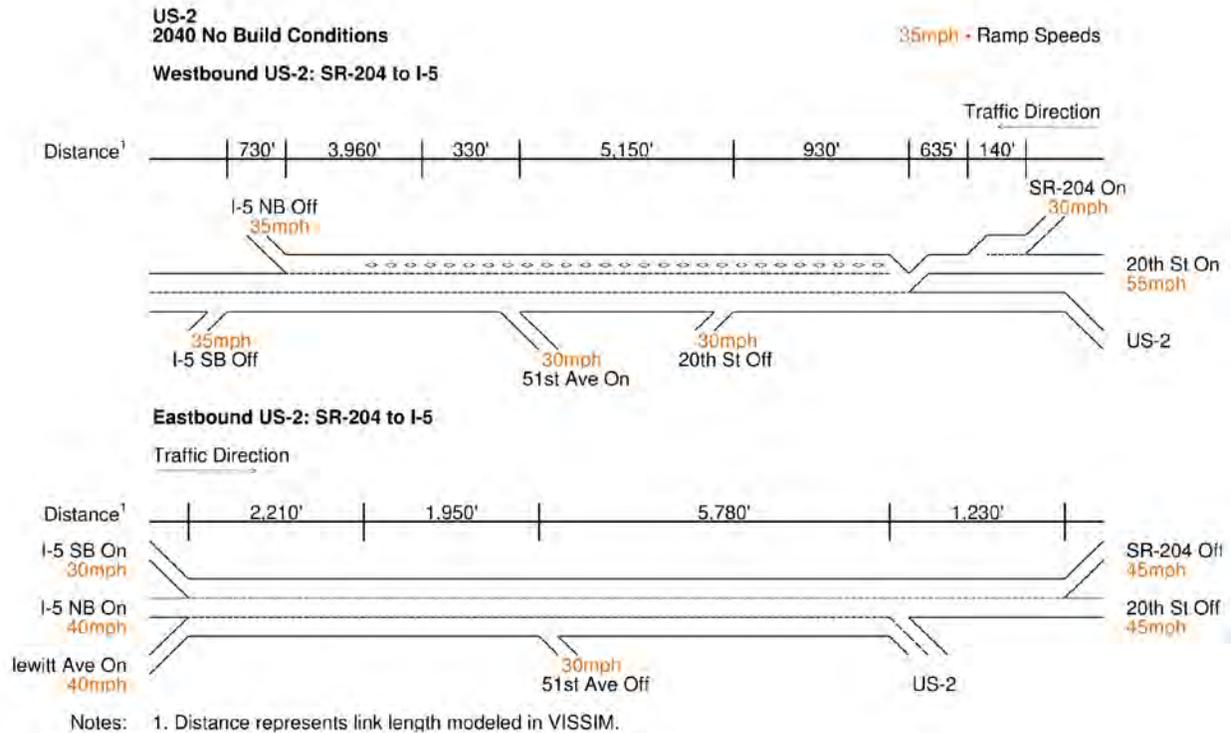


Figure 3-9. No-Build 2040 Traffic Configuration

Corridor Operations

The increase in demand from present day to 2040 results in significantly worse travel times for WB traffic during the AM peak. Travel times are expected to worsen to more than twice the duration of existing travel times for those originating on SR 204, and three times the travel time for those originating on 20th Street SE. Corridor travel times for mainline US 2 WB traffic will increase by 75 percent. EB traffic during the AM peak will see only minimal increase in travel time from present-day conditions.

During the PM peak, WB travel times are worst for those traveling on mainline US 2. While SR 204 and 20th Street SE travelers experience moderate increase in travel time, the mainline travel times increase from 4:25 to 12:00 minutes. Travel times for EB traffic in the PM peak decrease for those exiting at the US 2/SR 204/20th Street SE interchange and are approximately the same for mainline US 2.

There is no travel-time benefit for transit or HOV traffic in the no-build configuration.

Forecast travel times through the study corridor are listed in Table 3-9.

TABLE 3-9. NO-BUILD (2040) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	32:00	8
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	28:05	8
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	14:20	17
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:05	50
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	5:35	39
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:00	53
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	6:20	41
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	8:15	27
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	12:00	20
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	6:35	39
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	6:30	34
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:20	42

Freeway Operations

By 2040, speeds deteriorate substantially in the AM peak hour along each of the WB approach routes to the US 2/SR 204/20th Street SE interchange, as shown in Figure 3-10. Increasing traffic demands continue to be constrained by the limited merging capacity at the study interchange, resulting in travel speeds less than 10 miles per hour. The addition of the HOV lane on the WB trestle and constrained traffic demands result in good speeds on the trestle approaching downtown Everett and I-5.

The US 2/SR 204/20th Street SE interchange is not forecasted to be able to serve any additional westbound demand during the AM peak hour in the 2040 No Build scenario, therefore the LOS degrades upstream of the US 2/Bickford Ave interchange. Downstream of the study interchange, forecast 2040 LOS is similar to existing conditions. The average vehicle density at the Bickford Ave on-ramp merge section increases by over six times. This results from increased demand and a change in the geometry at the ramp from an add lane to a merge condition. This condition also exists during the PM peak hour (Figure 3-11) with the demand from westbound US 2 increasing by 50 percent compared with the existing demand. Similarly, not all of the westbound demand during the PM peak hour can be served through the study interchange. Also during the PM peak hour, and similar to the 2025 No Build scenario, the eastbound merge section from I-5 and Hewitt Avenue is forecasted to degrade from LOS D to LOS F due to increased demand. Table 3-10 shows the No-Build Alternative year 2040 LOS and speeds for all segments.

West of the study intersection, speeds improve for vehicles as they continue WB beyond the bottleneck point – the constraint at the study interchange limits access to WB US 2 to the extent that the downstream freeway segments operate at better levels of service than existing conditions.

The forecast analysis for the design year (2040) shows slightly improved operations along the WB trestle, due to the planned trestle widening and resulting increased capacity along US 2; however, the increased demand at the study interchange causes significantly worse congestion along the surface streets and

mainline US 2 upstream of the interchange, with backups extending beyond the limits of the study. Without any improvement to the US 2/SR 204/20th Street SE interchange, throughput measured at the interchange remains the same, while demand is expected to increase by almost 30 percent.

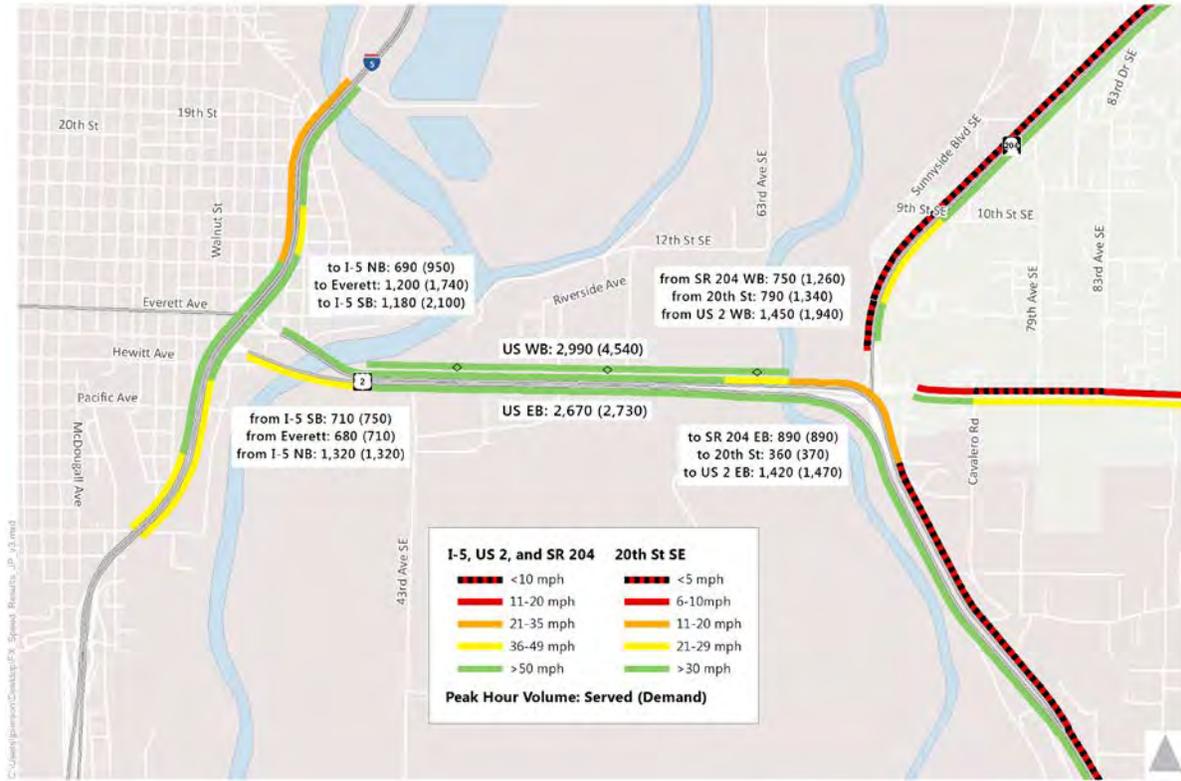


Figure 3-10. No-Build (2040) Speeds - AM

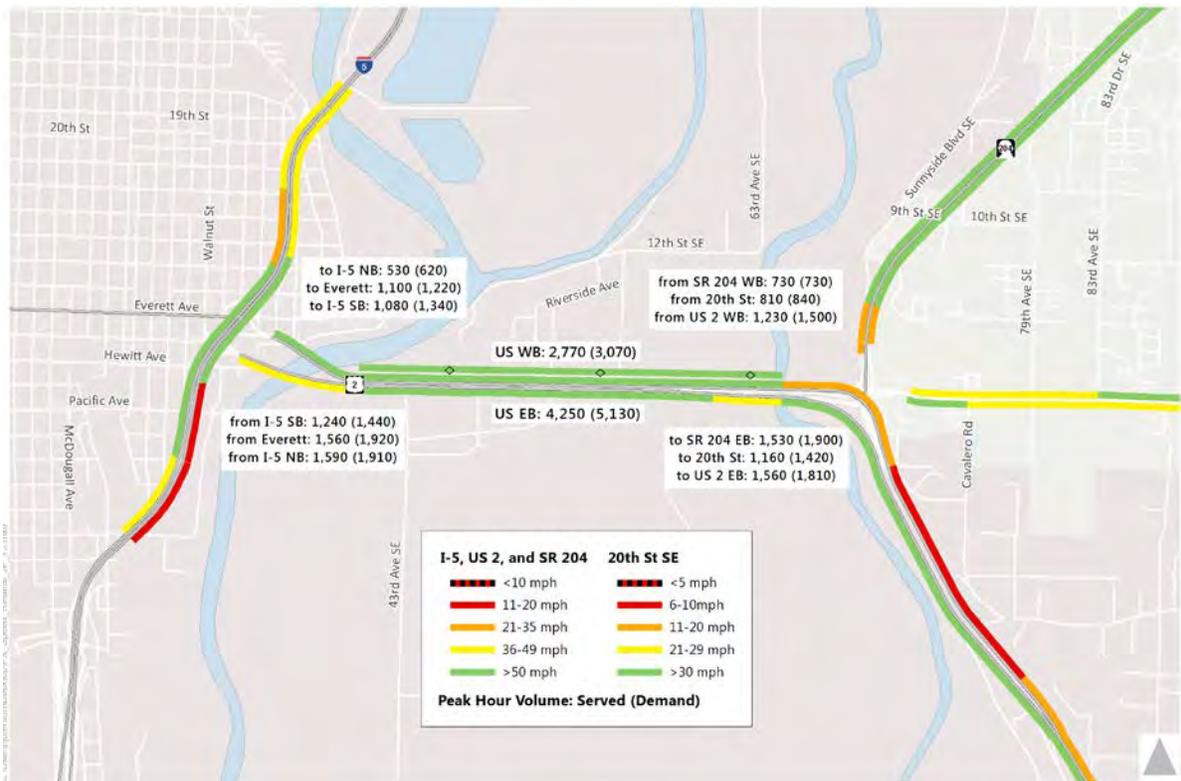


Figure 3-11. No-Build (2040) Speeds - PM

TABLE 3-10. NO-BUILD (2040) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	F	F	141	138	4	5	500	250
US 2 WB: SR 204 EB Off-ramp	Diverge	F	F	121	108	7	8	10	110
US 2 WB: SR 204 WB/20th St On-ramp to 20th St Off-ramp	Weave	D	D	31	29	44	45	1,060	40
US 2 WB: 20th St Off-ramp to Ebey Island On-ramp	Basic	C	C	23	19	53	57	10	0
US 2 WB: Ebey Island On-ramp	Merge	D	C	30	23	50	56	220	230
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	D	C	29	23	52	57	20	10
US 2 WB: I-5 NB On-ramp	Diverge	C	C	25	20	52	56	0	0
US 2 WB: I-5 SB On-ramp	Diverge	D	C	28	24	47	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	B	F	19	43	48	35	50	880
US 2 EB: Ebey Island Off-ramp	Diverge	B	C	17	28	55	54	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	C	D	20	27	54	52	10	10
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	F	20	45	53	37	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	13	14	56	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	B	15	16	52	50	150	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	16	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	15	17	57	57	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	F	42	106	40	18	10	1,220
I-5 NB: US 2 EB Off-ramp	Diverge	C	F	28	88	46	19	0	0
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	19	19	55	50	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	C	C	25	28	45	43	260	450
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	E	F	40	49	43	33	480	320
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	31	28	54	52	0	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	29	29	54	54	800	80
I-5 SB: Pacific Ave On-ramp	Merge	D	F	35	50	45	34	10	150

Operations at Crossroad Intersections

The no-build analysis of the local network in 2040 shows all intersections along the approach corridors failing LOS operating criteria, as shown in Table 3-11. The congestion causing this degradation is illustrated by the queues depicted in Figure 3-12. During the PM peak, the intersection of SR 204 and 20th Street SE is also operating at LOS F.

TABLE 3-11. NO-BUILD (2040) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (s/veh)	
		AM	PM	AM	PM
SR204/20th Street	All-way stop	B	F	13	89
SR 204/Sunnyside	Side-street stop	F	D	101	34
SR 204/9th	Side-street stop	F	B	197	11
Cavalero/20th St	Signal	F	C	229	27
51st Ave/US 2 WB ramps	All-way stop	A	A	5	5
51st Ave/US 2 EB ramps	All-way stop	B	C	11	19
79th Ave SE/20th St SE	Signal	F	B	464	14
83rd Ave SE/20th St SE	Signal	F	B	329	18
91st Ave SE/20th St SE	Signal	F	C	131	20

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network.

- SR 204/Sunnyside Blvd SE: EB queue on Sunnyside Blvd turning right onto SR 204.
- 20th Street SE/Cavalero Road: SB approach to Cavalero Road
- 20th Street SE/79th Ave SE: SB approach queues on 79th Ave SE. WB movement extends to 83rd Ave SE
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length. SB left turn exceeds pocket length.
- 20th Street SE/91st Ave SE: SB left turn exceeds pocket length.
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short.)

For many cross-streets, the queues are caused by the high traffic demand for WB travel on 20th Street SE, creating less signal green time for the cross-street volumes. However, in 2040 the WB queues are much shorter along 20th Street SE due to the addition of a lane in each direction assumed for 2040.

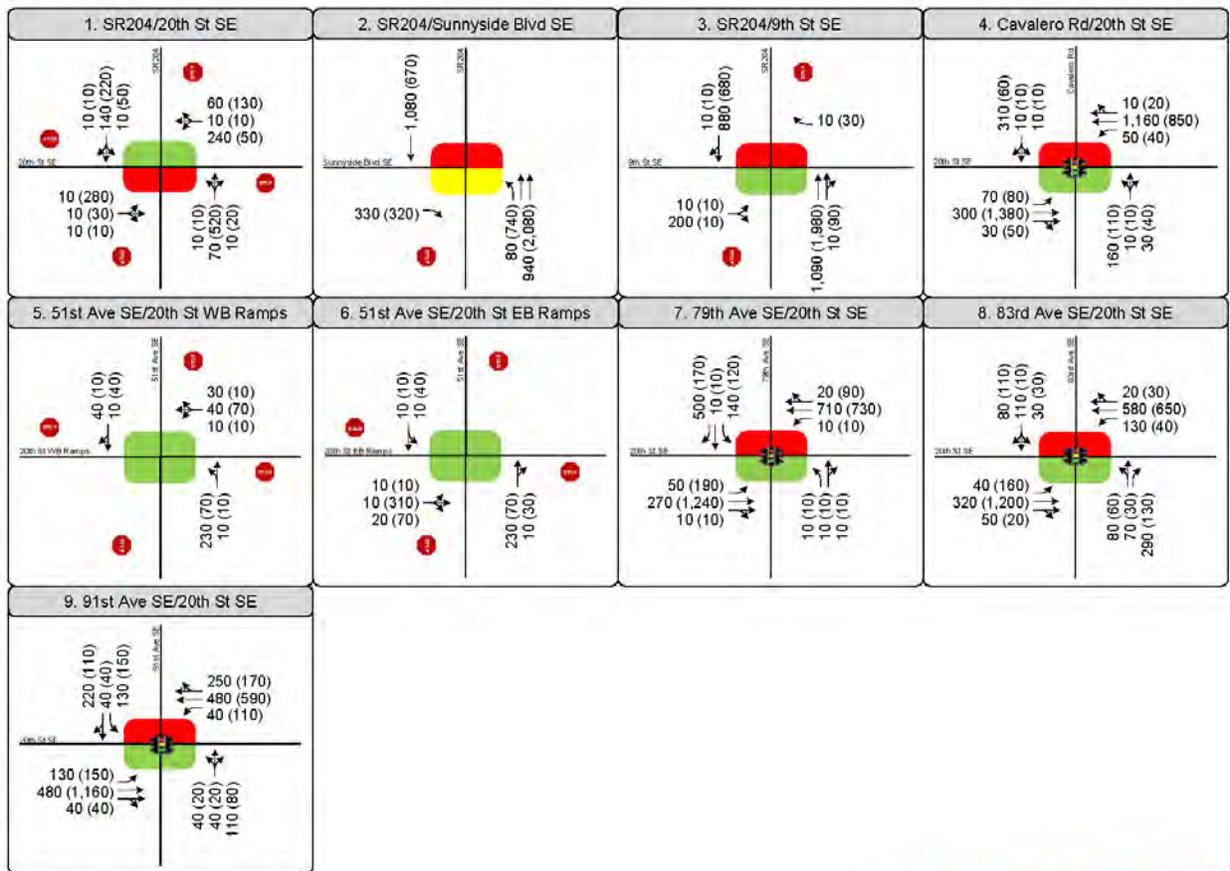


Figure 1
Peak Hour Traffic Volumes and Lane Configurations
2040 No Build Conditions



Figure 3-12. No-Build (2040) Intersection Turning Movements

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/ 20th Street SE (lower roadway): NB movement on SR 204 extends back to off-ramp from WB US 2
- SR 204/Sunnyside Blvd SE: NB left turn exceeds pocket length
- 20th Street SE/79th Ave SE: SB left turn exceeds pocket length
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length
- 20th Street SE/91st Ave SE: SB left turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short.)

Additional detail regarding intersection analysis is available in Appendix D.

3.3.3 Preliminary Preferred Alternative

The Preliminary Preferred Alternative (PPA; Figure 3-13) is described as Alternative 3 in Policy Point 2. The design assumes that the WB US 2 trestle operates with four lanes. Mainline US 2 has two WB lanes from Bickford Ave to the trestle; the SR 204 on-ramp adds one lane to the mainline, followed by the 20th Street SE on-ramp. There is no exit to Ebey Island from WB US 2; access to the lower roadway along Ebey Island is provided at the intersection of SR 204 and 20th Street SE.

The SR 204 on-ramp was designed as a single lane. The 20th Street SE on-ramp was designed with the assumption that this corridor may have an HOV lane prior to the construction of this interchange project. The on-ramp begins with two, which merge into a single lane prior to joining the US 2 mainline as an add lane. The on-ramp was designed to allow inclusion of a ramp meter.

An HOV lane on the WB trestle starts 2000 feet after the mainline and two ramp movements come together at the US 2/SR 204/20th Street SE interchange.

Opening Year (2025)

The Opening Year configuration assumes that the WB US 2 trestle structure has not yet been replaced; the completed US 2/SR 204/20th Street SE interchange will be supplemented with temporary roadway elements to transition the new interchange to the original alignment and drop the two new lanes brought by SR 204 and 20th Street SE. Posted speeds are depicted in Figure 3-14.

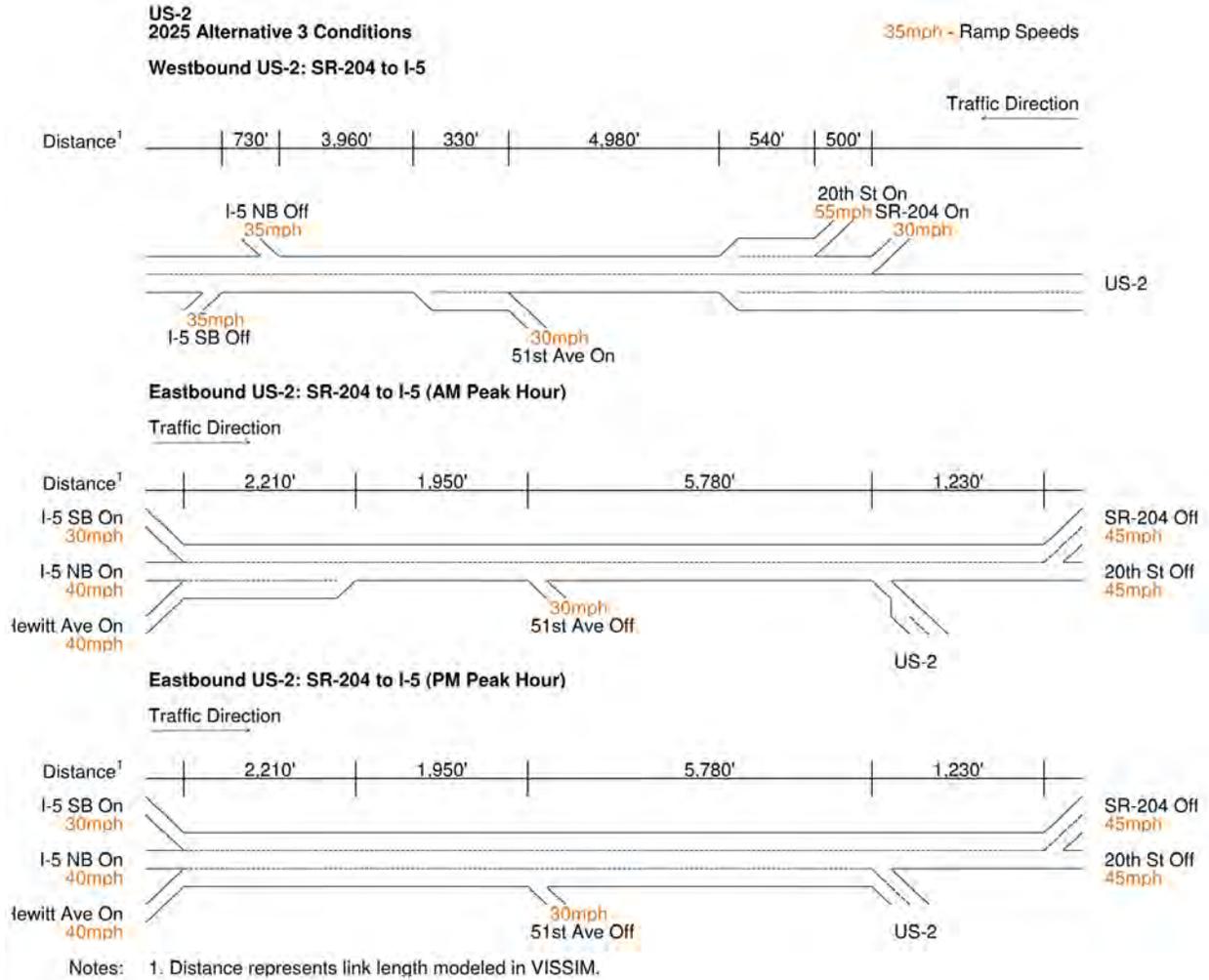


Figure 3-13. PPA 2025 Traffic Configuration

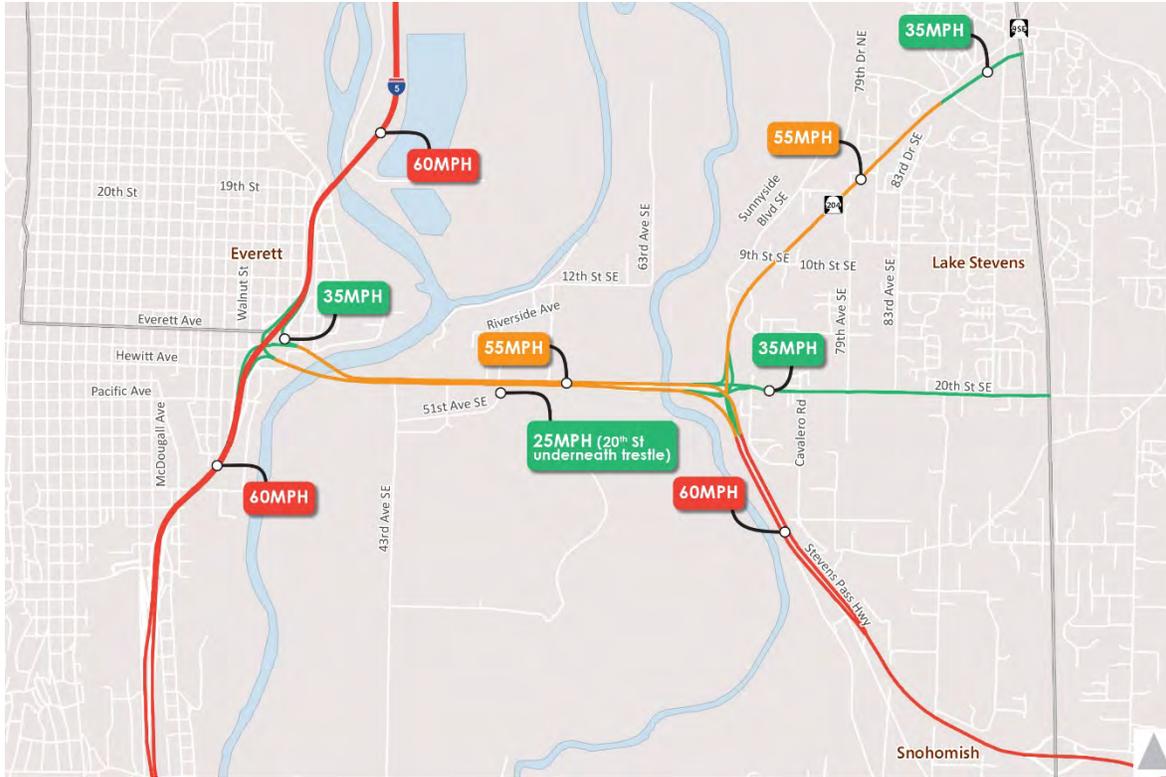


Figure 3-14. PPA 2025 Posted Speeds

Corridor Operations

During the AM peak, all WB traffic travel times are improved over no-build forecasts by 15 to 30 percent. EB traffic through the study corridor will experience similar travel times to the no-build alternative.

During the PM peak, travel times for WB traffic are expected to increase by as much as 10 percent, due to increased traffic demand being able to access the trestle compared to the no-build condition. EB travel times will increase by up to one minute.

Table 3-12 summarizes the design year operations. Figure 3-15 and Figure 3-16 depict AM and PM posted speeds, respectively.

There is no benefit for HOV travelers in the opening year.

TABLE 3-12. PPA (2025) CORRIDOR TRAVEL TIMES

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	11:30	22
From 20th Street SE at 83rd Ave SE to I-5 at Pacific Ave	WB	9:40	23
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:25	29
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:15	48
From I-5 at Pacific Ave to 20th Street SE at 83rd Ave SE	EB	5:25	41
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:20	50
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:35	46
From 20th Street SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:40	40
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	5:25	45
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	7:40	33
From I-5 at Pacific Ave to 20th Street SE at 83rd Ave SE	EB	8:50	25
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	7:20	37

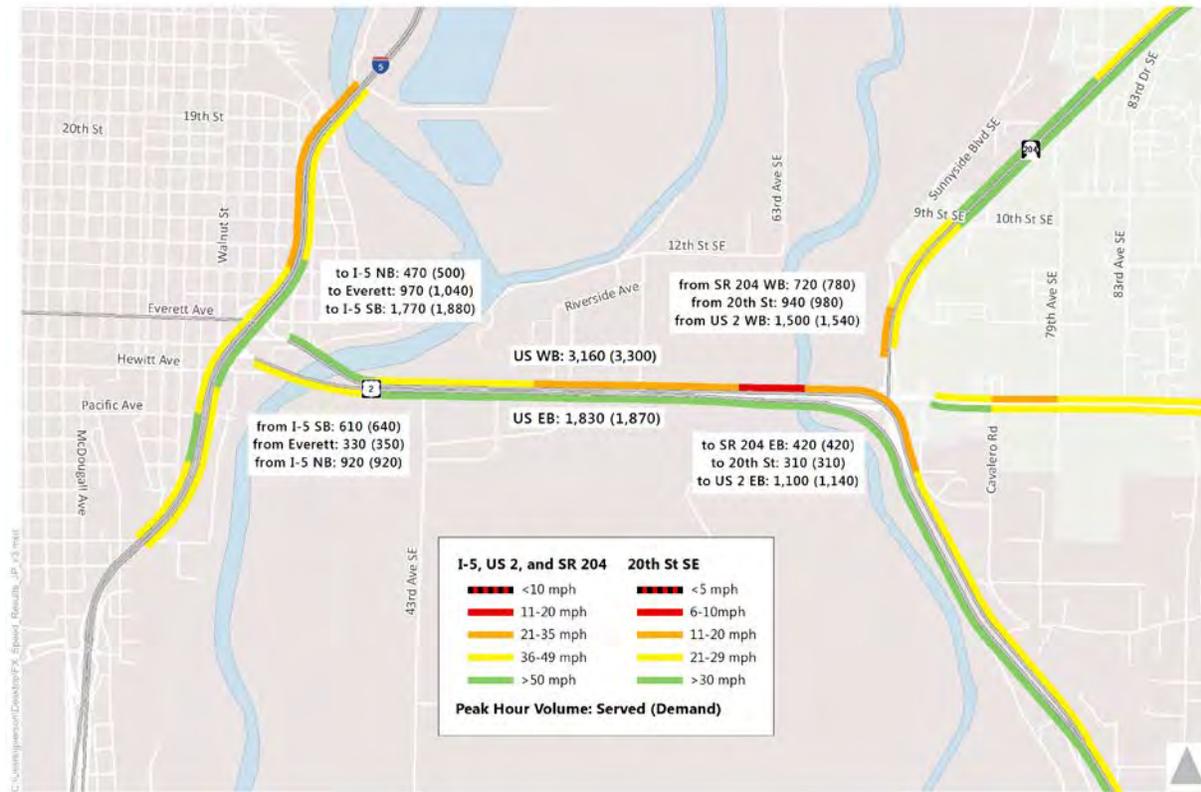


Figure 3-15. PPA (2025) Speed Diagram – AM

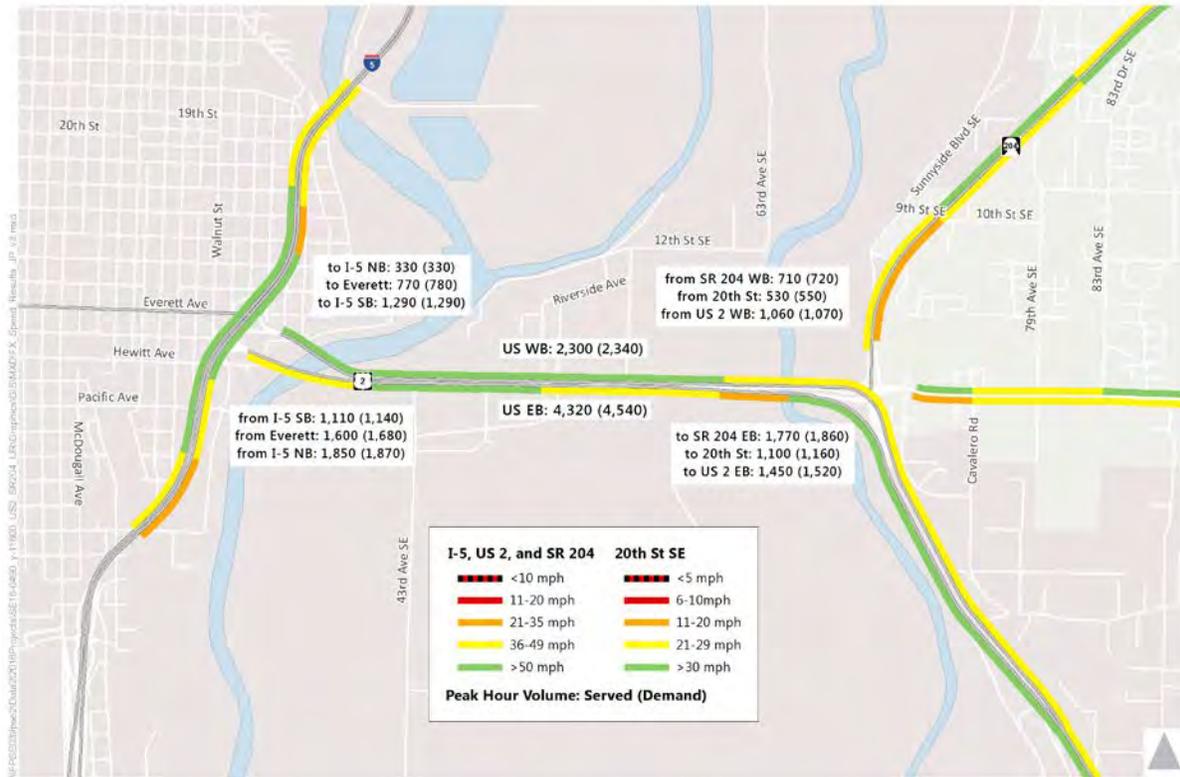


Figure 3-16. PPA (2025) Speed Diagram – PM

Freeway Operations

The improvements to the US 2/SR 204/20th Street SE interchange in the 2025 PPA scenario result in more westbound demand being served during the AM peak hour from SR 204, 20th Street SE, and US 2. As shown in Table 3-13, the additional volume merging onto the US 2 trestle, from 4 lanes to 2 lanes, results in worse forecasted LOS (D to F) from the SR 204 merge to Ebey Island on-ramp merge compared with the No Build scenario. During the PM peak hour (Table 3-14), the only location on eastbound US 2 with a substantial change in forecasted LOS is at the SR 204/20th Street off-ramp, which changes from LOS E to LOS F.

Operations at Crossroad Intersections

As summarized in Table 3-15, analysis of local network intersections during the opening year shows that operations have improved for the intersections along 20th Street SE which had been failing during the no-build alternative for 2025. Sunnyside Ave continues to operate at LOS F. In the PM peak hour, the SR 204/20th Street SE intersection would operate at LOS E with an all-way stop. By 2040 it was assumed that this intersection would be signalized to handle the increased traffic demand. If a signal were installed in 2025, this intersection would operate at a good level of service. Figure 3-17 depicts the LOS and congestion queues.

TABLE 3-13. PPA (2025) FREEWAY OPERATIONS –AM PEAK

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025
US 2 WB: Bickford Ave On-ramp	Merge	F	C	56	23	28	47	10	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	B	120	20	9	47	20	0
US 2 WB: SR 204 On-ramp	Merge	–	F	–	81	–	21	–	80
US 2 WB: 20th St On-ramp	Merge	D	F	33	137	43	10	260	80
US 2 WB: SR 204 WB On-ramp to Ebey Island On-ramp	Basic	D	F	35	86	46	18	0	50
US 2 WB: Ebey Island On-ramp	Merge	F	F	50	65	36	26	20	20
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	E	E	42	43	45	45	0	0
US 2 WB: I-5 NB Off-ramp	Diverge	D	D	34	34	50	51	0	0
US 2 WB: I-5 SB Off-ramp	Diverge	D	D	31	31	51	52	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	D	C	32	26	47	52	40	50
US 2 EB: Ebey Island Off-ramp	Diverge	C	C	26	25	40	40	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	B	B	17	17	54	55	0	0
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	C	21	20	53	53	0	0
US 2 EB: SR 204 EB/20th Street Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	C	B	21	17	45	46	150	80
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	15	51	50	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	12	13	50	49	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	E	40	40	39	43	0	0
I-5 NB: US 2 EB Off-ramp	Diverge	C	C	22	23	50	50	0	0
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	E	E	38	40	43	41	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	C	31	27	43	47	20	10
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	F	51	51	31	31	460	480
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	32	30	47	48	10	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	31	31	53	53	180	120
I-5 SB: Pacific Ave On-ramp	Merge	E	E	37	39	44	44	0	10

TABLE 3-14. PPA (2025) FREEWAY OPERATIONS –PM PEAK

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queues (ft)	
		No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025
US 2 WB: Bickford Ave On-ramp	Merge	B	B	19	16	46	45	0	10
US 2 WB: SR 204 EB Off-ramp	Diverge	D	D	30	29	35	35	0	0
US 2 WB: 20th St On-ramp	Merge	-	C	-	21	-	42	-	10
US 2 WB: SR 204 WB On-ramp	Merge	C	C	28	26	45	44	20	20
US 2 WB: SR 204 WB On-ramp to Ebey Island On-ramp	Basic	C	C	21	24	57	52	0	0
US 2 WB: Ebey Island On-ramp	Merge	C	C	27	23	55	52	0	0
US 2 WB: 5Ebey Island On-ramp to I-5 NB On-ramp	Basic	C	C	22	24	57	53	0	0
US 2 WB: I-5 NB On-ramp	Diverge	C	D	22	29	57	44	0	0
US 2 WB: I-5 SB On-ramp	Diverge	C	C	25	24	51	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	E	E	41	37	36	36	370	140
US 2 EB: Ebey Island Off-ramp	Diverge	C	D	27	33	54	46	0	10
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	D	F	26	49	54	38	0	30
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	E	F	39	69	41	23	0	50
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	53	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	E	14	36	53	38	0	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	15	15	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	13	13	58	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	F	F	112	76	17	26	1,050	120
I-5 NB: US 2 EB Off-ramp	Diverge	F	F	97	54	19	38	10	10
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	18	22	51	54	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	F	30	47	41	31	100	90
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	D	D	30	32	47	44	30	30
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	C	C	22	23	56	53	0	0
I-5 SB: US 2 WB On-ramp	Merge	C	C	24	25	59	53	0	0
I-5 SB: Pacific Ave On-ramp	Merge	E	E	39	37	41	45	20	20

TABLE 3-15. PPA (2025) INTERSECTION OPERATIONS

Intersection	Control Type	LOS ¹		Delay (s/veh) ²	
		AM	PM	AM	PM
SR204/20th Street SE	All-way stop	C	E	21	46
SR 204/Sunnyside	Side-street Stop	F	F	303	79
SR 204/9th Street SE	Side-street Stop	A	B	7	12
Cavalero/20th Street SE	Signal	C	C	23	28
51st Ave/US 2 WB Ramps	All-way Stop	A	A	4	4
51st Ave/US 2 EB Ramps	All-way Stop	A	B	9	12
79th Ave SE/20th Street SE	Signal	B	B	16	18
83rd Ave SE/20th Street SE	Signal	D	B	36	13
91st Ave SE/20th Street SE	Signal	B	C	20	27
1. Goal as stated in Table 1-3: LOS = D 2. Goal as stated in Table 1-3: Improvement over No-Build					

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE: EB queue on Sunnyside Blvd (estimated shorter than No Build, but still extends beyond Vissim network).
- 20th Street SE/79th Ave SE: SB approach on 79th Ave SE
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length
- Ebey Island on-ramp/SR 204 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

On 20th Street SE, WB queues are shorter than for the No-Build Alternative, but they are still evident because 20th Street SE is not assumed to be fully widened to four lanes until after 2025.

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE: NB left turn exceeds pocket length
- 20th Street SE/79th Ave SE: SB left turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)
- 51st Ave SE/US 2 EB off-ramp: SB traffic extends through the intersection with the WB on-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Overall queue lengths are lower than in the No-Build Alternative with the exception of those noted above, which are similar to No Build.

Additional detail regarding intersection analysis is presented in Appendix D.

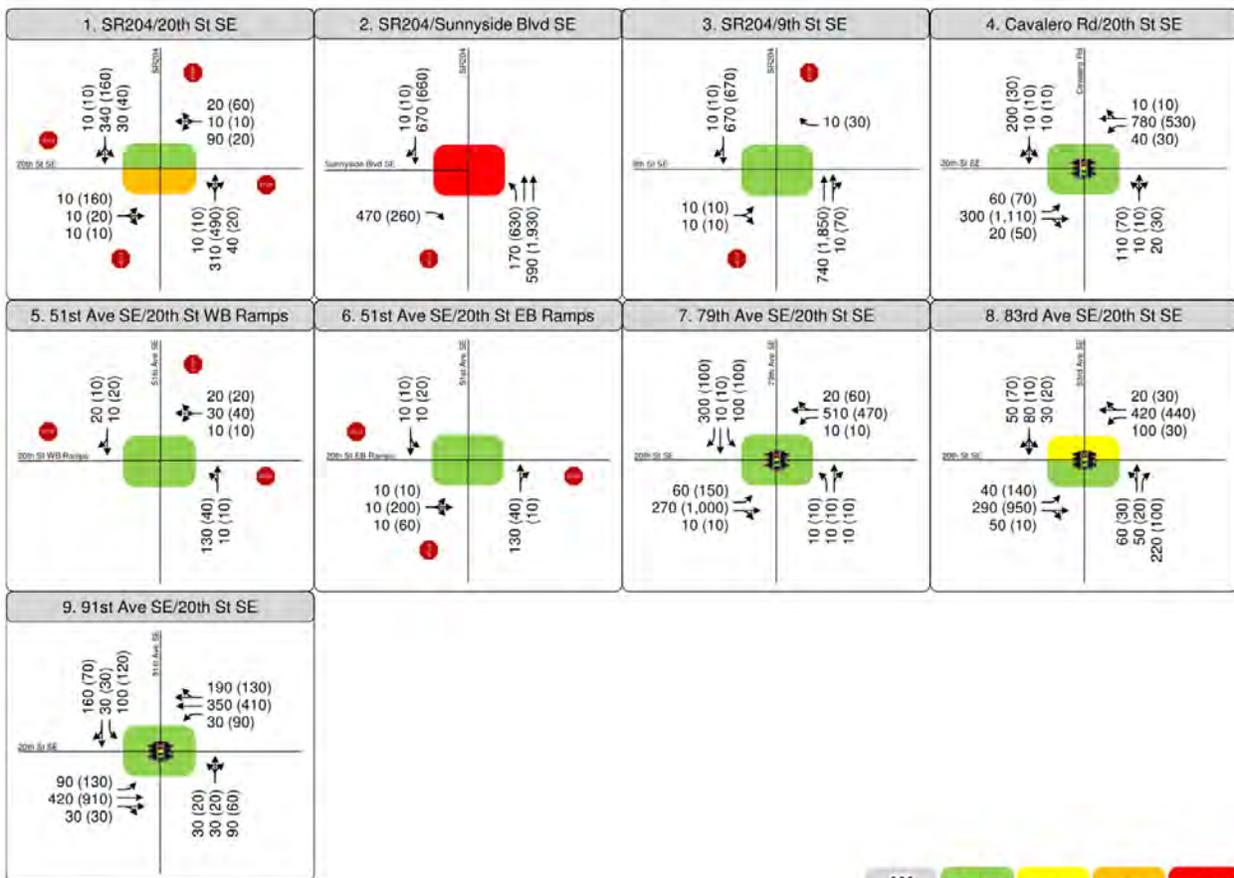


Figure
Peak Hour Traffic Volumes and Lane Configurations
2025 Concept 5 Conditions



Figure 3-17. PPA (2025) Intersection Turning Movements

Design Year (2040)

The design year analysis of the Preliminary Preferred Alternative assumes the completion of the WB US 2 trestle structure replacement. The study interchange is operational as designed, connected to the new alignment of WB US 2 and a widened three or four-lane highway downstream. The final configuration is illustrated in Figure 3-19, with posted speeds as noted in Figure 3-18.

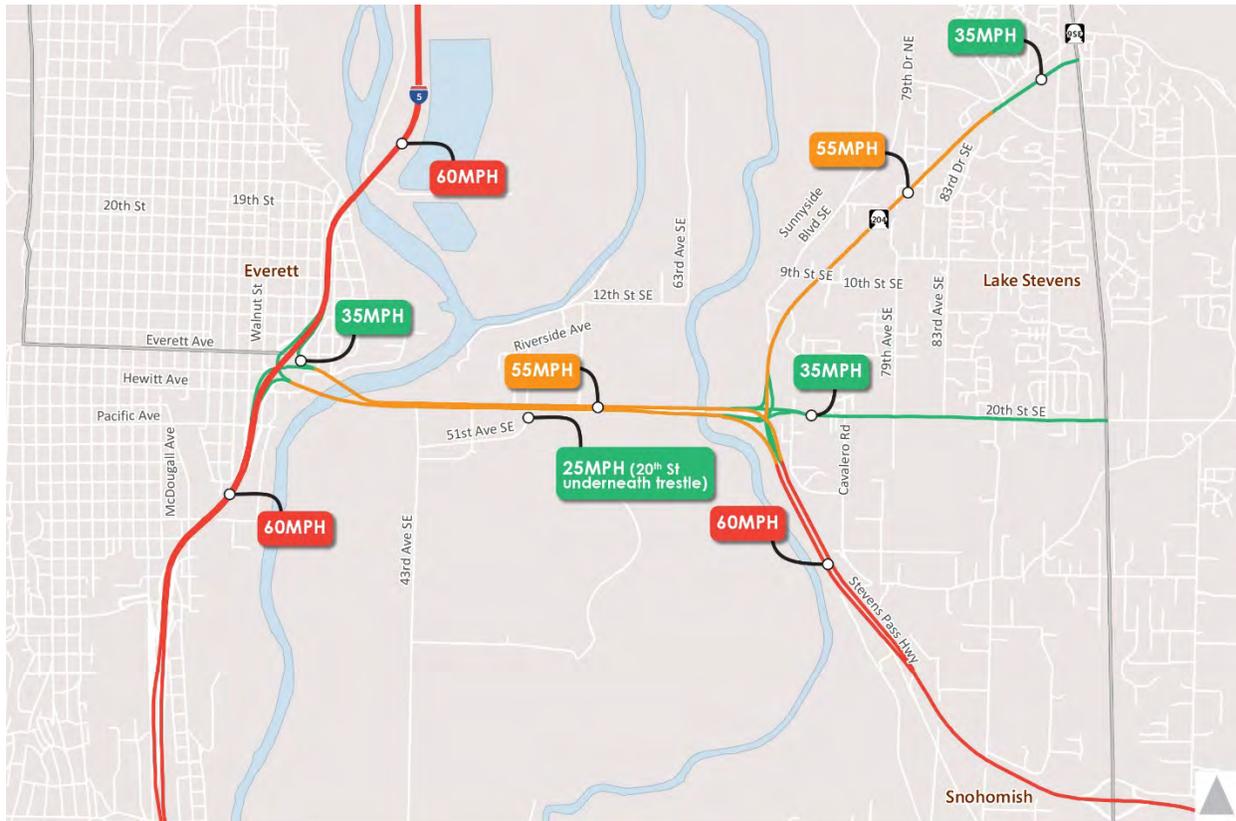


Figure 3-18. PPA 2040 - Posted Speeds

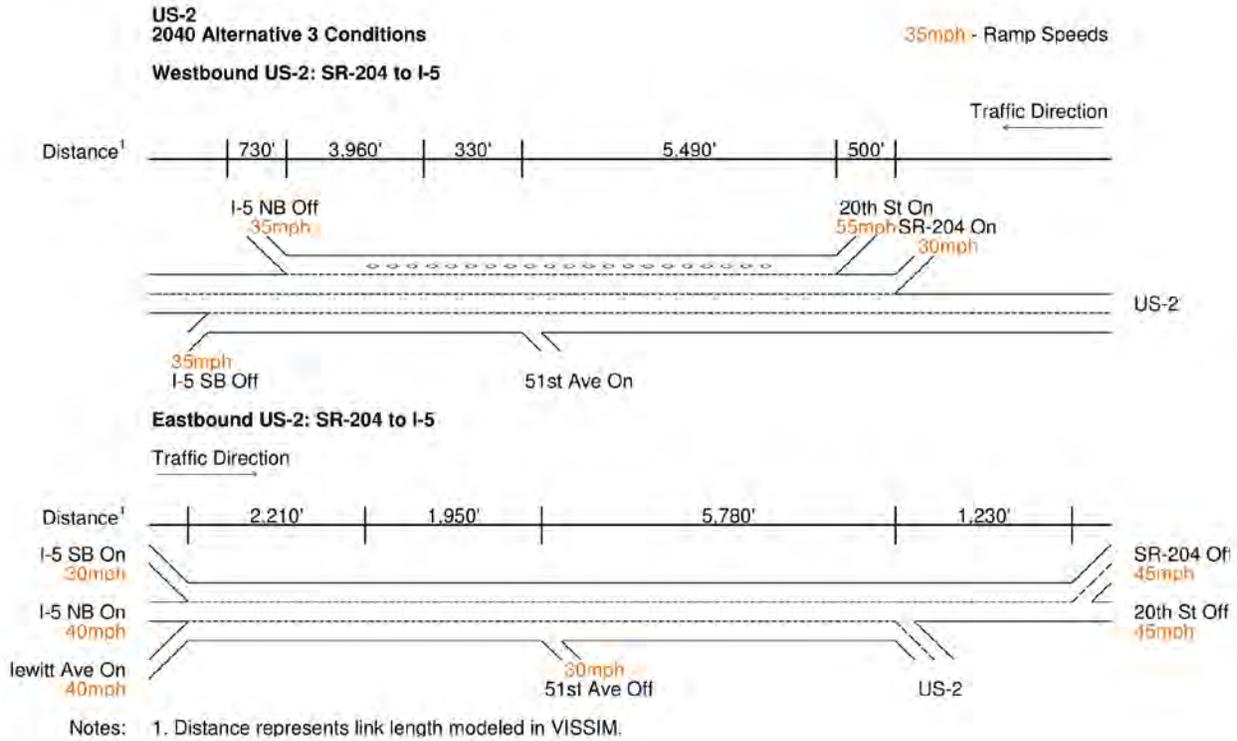


Figure 3-19. PPA 2040 Traffic Configuration

Corridor Operations

During the AM peak, WB SR 204 and 20th Street SE traffic travel times are significantly improved over no-build forecasts while EB traffic travel times remain the same. WB HOV and transit vehicles save about 2 minutes through corridor, with an additional 2-minute benefit for HOV originating on 20th Street SE.

In the PM peak, all WB and EB corridor routes experience improved travel times except EB US 2 through traffic, which experiences no change in travel time. WB HOV traffic benefits from 10 to 15-second travel time savings over GP traffic in the PM peak. A summary of design year operations is presented in Table 3-16.

TABLE 3-16. PPA (2040) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	15:40	16
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	17:35	13
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	14:30	17
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:00	50
From I-5 at Pacific Ave to 20th Street SE at 83rd Ave SE	EB	5:30	40
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:10	52

PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:30	47
From 20th Street SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:40	39
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	5:25	45
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	6:15	40
From I-5 at Pacific Ave to 20th Street SE at 83rd Ave SE	EB	6:20	35
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:20	42

Freeway Operations - AM Peak Hour

The PPA increases the volume of westbound traffic that can be served through the US 2/SR 204/20th Street SE interchange by over 1,000 vehicles during the AM peak hour. However, this additional volume cannot be completely served through the downstream interchange at US 2/I-5, and many vehicles remain queued on the US 2 trestle during the PM AM peak hour.

As a result, the downstream trestle segment of WB US 2 operates at slower speeds compared to the no-build, while the upstream portion of mainline US 2 improves. Speed benefits are also seen along the surface streets, as illustrated in Figure 3-20 (compare to Figure 3-10). Combined, these changes in speeds result in the corridor travel time improvements listed in Table 3-16.

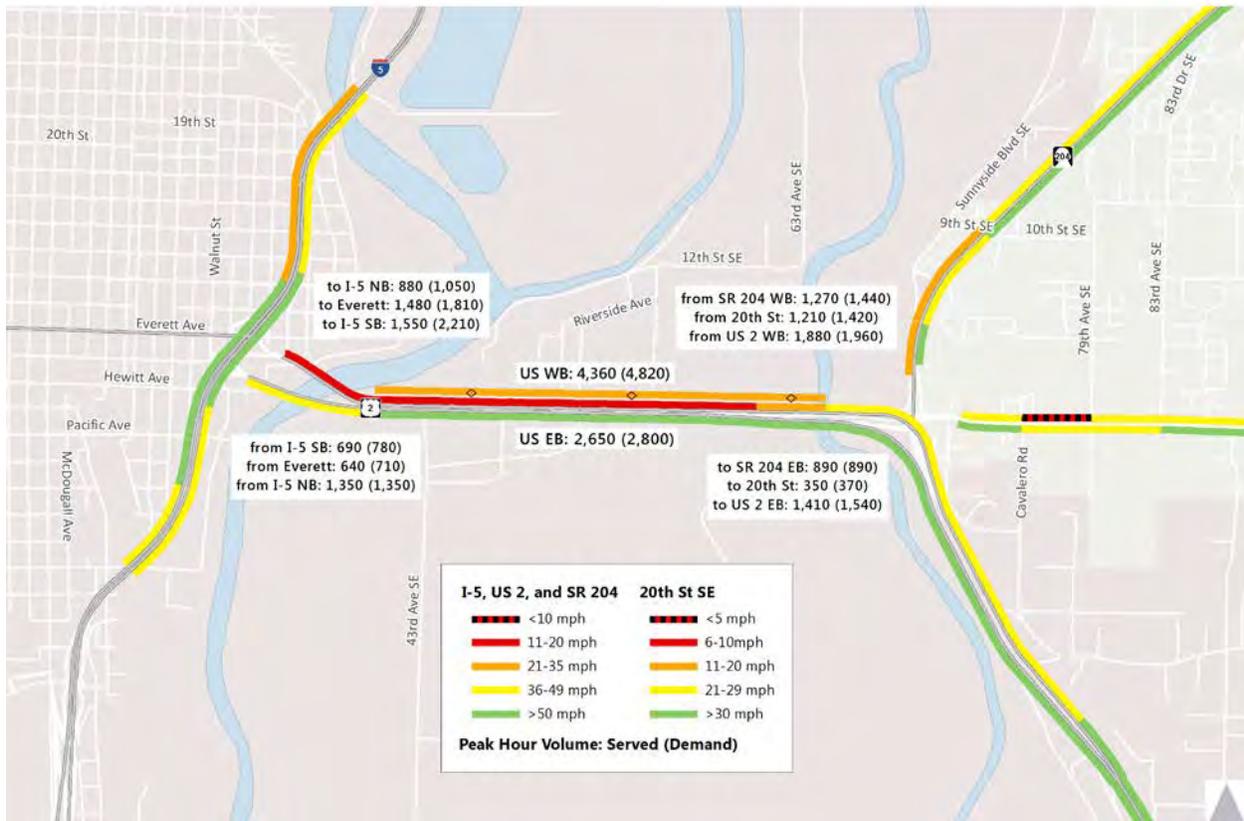


Figure 3-20. PPA Corridor Speeds (2040 AM)

The AM peak freeway operations for the PPA are shown in Table 3-17. These results show the levels of service (LOS) on the mainline freeway segments, not on individual ramps. Of primary interest is the LOS for the mainline sections of US 2. On US 2 WB, there are 2 analysis sections upstream of the interchange that extend from the Bickford Ave on-ramp to the off-ramp to SR 204. The LOS in these sections improve from LOS F to C with the PPA.

The next set of freeway sections cover the US 2 trestle portion from the merge of the new SR 204 WB on-ramp to the off-ramps to I-5. The LOS in these sections worsen from LOS C/D to LOS F, consistent with the speed degradation shown in Figure 3-20. LOS gradually improves westbound along the trestle with density decreasing from 120 VPLPM to 80 VPLPM, although the speeds remain low in those sections. As previously noted, there is a net positive effect of the PPA on WB travel times in the corridor, even though individual freeway segments would have slower speeds or worse LOS.

The freeway operations analysis does not analyze the LOS of individual ramps, such as those on SR 204 and 20th Street approaching US 2. However, traffic conditions on those ramps are reflected in the average corridor speeds and travel times previously reported. Looking at the Vissim simulation, it is evident that much more traffic is able to flow through the interchange with the PPA, with increased speeds and reduced ramp queuing.

TABLE 3-17. PPA (2040) FREEWAY OPERATIONS - AM PEAK HOUR

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		No Build	PPA	No Build	PPA	Facility	Type	No Build	PPA
US 2 WB: Bickford Ave On-ramp	Merge	F	C	141	24	4	40	500	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	C	121	22	7	47	10	0
US 2 WB: SR 204 On-ramp	Merge	-	F	-	99	-	15	-	240
US 2 WB: 20th Street On-ramp	Merge	D	F	31	119	44	9	1,060	240
US 2 WB: SR 204 WB On-ramp to Ebey Island On-ramp	Basic	C	F	23	115	53	10	10	580
US 2 WB: Ebey Island On-ramp	Merge	D	F	30	118	50	11	220	120
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	D	F	29	107	52	12	20	80
US 2 WB: I-5 NB Off-ramp	Diverge	C	F	25	88	52	15	0	0
US 2 WB: I-5 SB Off-ramp	Diverge	D	F	28	79	47	17	0	10
US 2 EB: Hewitt Ave On-ramp	Merge	B	C	19	24	48	39	50	160
US 2 EB: Ebey Island Off-ramp	Diverge	B	B	17	17	55	55	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	C	B	20	17	54	54	10	0
US 2 EB: SR 204 EB/20th Street Off-ramp	Diverge	C	C	20	22	53	54	0	0
US 2 EB: SR 204 EB/20th Street Off-ramp to SR 204 WB On-ramp	Basic	B	B	13	13	56	56	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	B	15	15	52	51	150	90
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	15	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	15	16	57	57	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	F	42	49	40	35	10	10
I-5 NB: US 2 EB Off-ramp	Diverge	C	D	28	29	46	45	0	0
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	19	19	55	54	0	10
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	C	C	25	28	45	43	260	190
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	E	F	40	52	43	30	480	1,010
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	31	28	54	54	0	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	29	33	54	51	800	440
I-5 SB: Pacific Ave On-ramp	Merge	D	E	35	38	45	43	10	20

Freeway Operations – PM Peak Hour

During the PM peak hour, the forecasted LOS generally improves with the PPA.

In the PM peak hour, WB US 2 mainline operations (upstream of the study interchange) improve from no-build forecast LOS F in the design year to LOS C/D with the proposed interchange improvements. Speeds increase from less than 10 miles per hour to 30–50 miles per hour along this segment of the corridor.

WB operations downstream of the US 2/SR 204/20th Street SE interchange and EB operations are similar to the forecast no-build operations. There is some worsening of LOS D on US 2 at the off-ramp to NB I-5. These operations are illustrated in Figure 3-21. Measures of effectiveness are presented in tabular form in Table 3-18.

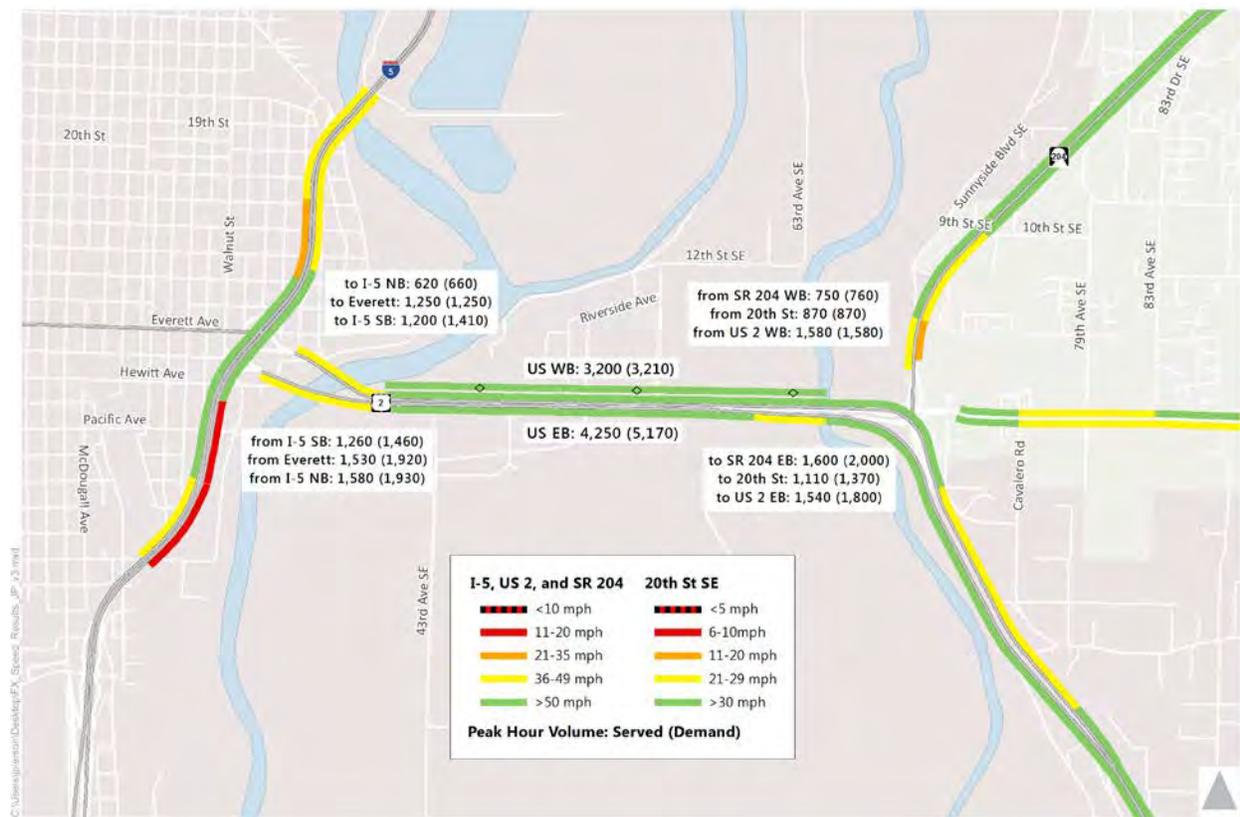


Figure 3-21. PPA Corridor Speeds (2040 PM)

TABLE 3-18. PPA (2040) FREEWAY OPERATIONS - PM PEAK HOUR

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queues (ft)	
		No Build	PPA	No Build	PPA	No Build	PPA	No Build	PPA
US 2 WB: Bickford Ave On-ramp	Merge	F	D	138	28	5	36	250	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	C	108	24	8	46	110	0
US 2 WB: SR 204 On-ramp	Merge	-	B	-	14	-	56	-	10
US 2 WB: 20th Street On-ramp	Merge	D	B	29	14	45	56	40	0
US 2 WB: SR 204 WB On-ramp to Ebey Island On-ramp	Basic	C	B	19	17	57	58	0	260
US 2 WB: Ebey Island On-ramp	Merge	C	B	23	18	56	58	230	0
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	C	C	23	21	57	53	10	0
US 2 WB: I-5 NB Off-ramp	Diverge	C	E	20	41	56	36	0	0
US 2 WB: I-5 SB Off-ramp	Diverge	C	C	24	25	51	39	0	40
US 2 EB: Hewitt Ave On-ramp	Merge	F	E	43	43	35	36	880	950
US 2 EB: Ebey Island Off-ramp	Diverge	C	C	28	27	54	54	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	D	D	27	26	52	54	10	0
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	F	E	45	40	37	46	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	B	16	16	50	50	0	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	16	16	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	17	17	57	57	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	F	F	106	107	18	18	1,220	1,320
I-5 NB: US 2 EB Off-ramp	Diverge	F	F	88	91	19	19	0	10
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	19	19	50	50	0	10
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	C	C	28	27	43	43	450	460
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	F	49	48	33	34	320	310
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	28	28	52	52	0	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	29	30	54	53	80	20
I-5 SB: Pacific Ave On-ramp	Merge	F	F	50	47	34	34	150	160

Operations at Crossroad Intersections

During the AM peak hour, the two intersections immediately upstream of the US 2/SR 204/20th Street SE interchange in either direction – two along SR 204 and two along 20th Street SE – operate at LOS F (see Table 3-19). All study intersections operate at LOS C or higher during the PM peak, with the exception of SR 204/Sunnyside. Figure 3-22 depicts the LOS and congestion queues.

TABLE 3-19. PPA (2040) INTERSECTION OPERATIONS

Intersection	Control Type	LOS ¹		Delay (s/veh ²)	
		AM	PM	AM	PM
SR204/20th St	Signal ³	A	C	8	23
SR 204/Sunnyside	Side-street stop	F	E	415	44
SR 204/9th St SE	Side-street stop	F	B	69	12
Cavalero/20th St SE	Signal	F	B	132	13
51st Ave/US 2 WB ramps	All-way stop	A	A	5	4
51st Ave/US 2 EB ramps	All-way stop	B	C	11	18
79th Ave SE/20th St SE	Signal	F	B	90	15
83rd Ave SE/20th St SE	Signal	D	C	45	20
91st Ave SE/20th St SE	Signal	C	B	20	18
1. Goal as stated in Table 1-3: LOS = D 2. Goal as stated in Table 1-3: Improvement over No-Build 3. No-Build control type: All-way stop					

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/Sunnyside Blvd SE: EB queue on Sunnyside Blvd
- 20th Street SE/Cavalero Road: SB approach to Cavalero Rd
- 20th Street SE/79th Ave SE: SB approach queues on 79th Ave SE. WB movement extends to 83rd Ave SE
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length. SB left turn exceeds pocket length.
- 20th Street SE/91st Ave SE: SB left turn exceeds pocket length.
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short.)

Westbound queues are much shorter along 20th Street SE due to the addition of a lane in each direction assumed for 2040.

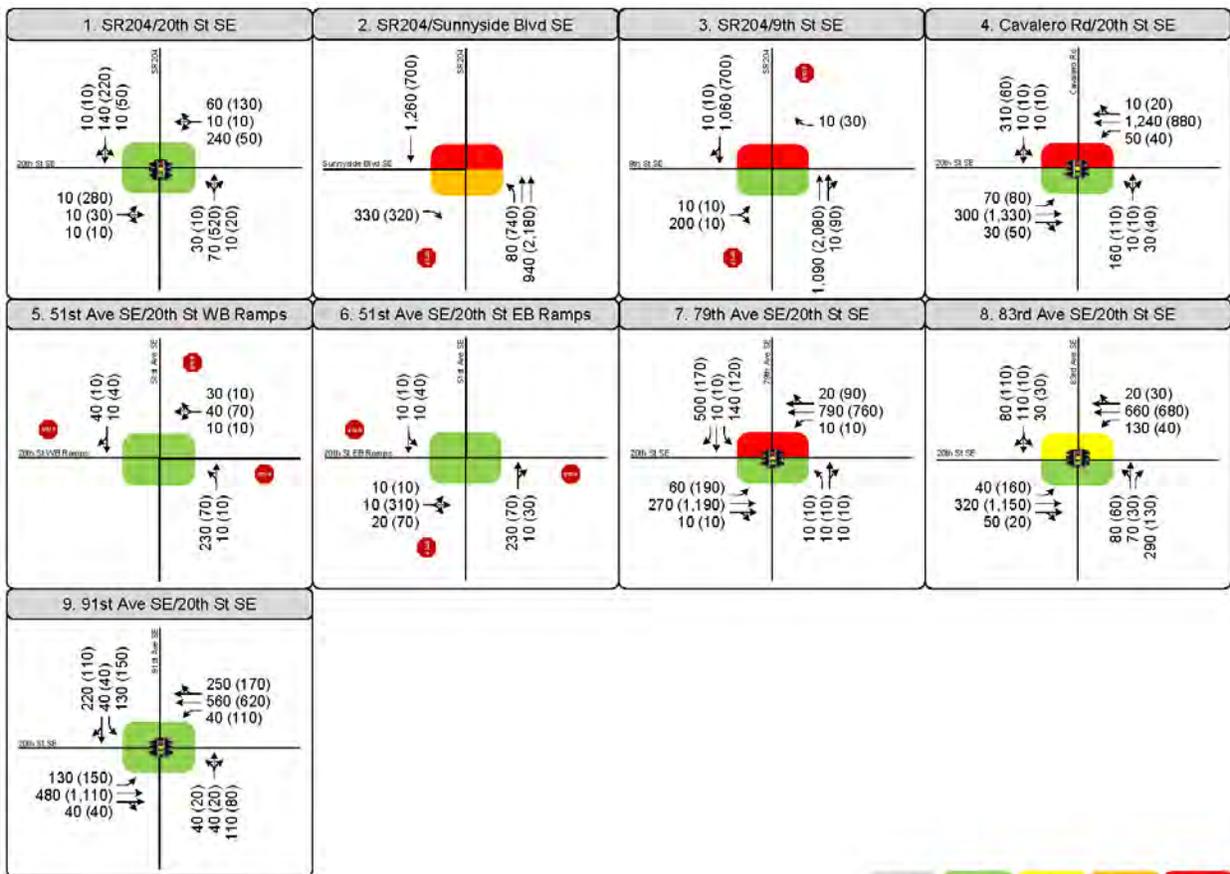


Figure
Peak Hour Traffic Volumes and Lane Configurations - AM (PM)
2040 Concept 5 Conditions

Figure 3-22. PPA (2040) Intersection Turning Movements PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the Vissim model network:

- SR 204/ 20th Street SE (lower roadway): NB movement on SR 204 extends back to off-ramp from WB US 2
- SR 204/Sunnyside Blvd SE: NB left turn exceeds pocket length
- 20th Street SE/79th Ave SE: SB left turn exceeds pocket length
- 20th Street SE/83rd Ave SE: NB right turn exceeds pocket length
- 20th Street SE/91st Ave SE: SB left turn exceeds pocket length
- 51st Ave SE/US 2 WB on-ramp: NB traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short.)

Additional detail regarding intersection analysis is available in Appendix D.

3.3.4 Network Impacts

Extent of Analysis

Intersections within the previously defined study corridor were analyzed to determine the operational impacts of interchange improvements to the local infrastructure. Intersections included in analysis were those immediately adjacent to the study interchange, as well as the two upstream intersections along SR 204 and three along 20th Street SE (Figure 3-23).



Figure 3-23. Study Intersections

Upgrades to Local Network / Cross-Roads

Two assumptions were made during the local network operations analysis. These are based on discussion with the City of Lake Stevens and their intended improvements, and are additions to the currently planned improvements outlined in Appendix A.

The current intersection of SR 204 and 20th Street SE is all-way stop controlled. It is recommended that a signal is installed at this intersection; the analysis discussed above assumes that this signal is in place in the future PPA scenario.

It is also recommended that 20th Street SE is widened from two to five lanes, two in each direction and a striped median or two-way left-turn lane. The possibility of an HOV lane along 20th Street SE and directly onto the WB US 2 highway is one that the local jurisdiction would like to keep available for future improvements. It is recommended that this widening occur within the State ROW as well, to allow continuity of alignment.

Local improvements to be completed in conjunction with the interchange improvements include widening 20th Street SE from the SR 204/20th Street SE intersection onto Ebey Island and providing an additional

lane on the island for traffic movements in both directions. This will allow local traffic to access Ebey Island via the SR 204/20th Street SE intersection rather than entering the highway at the US 2/SR 204/20th Street SE interchange and exiting shortly thereafter.

Jurisdiction Involvement

The City of Lake Stevens and Snohomish County representatives were present at all IJR Support Team Meetings, and participated actively in approving the baseline network assumptions as well as selection of the PPA. Meeting minutes are available for review in Appendix G.

3.4 COLLISION ANALYSIS

3.4.1 Observed Crash History

One of the primary goals for the interchange modification was to improve safety for the traveling public. To provide a basis for comparison, the existing crash data has been collected and analysis of the data has been completed for on the state facilities US 2 and SR 204 from January 2011 to December 2015. The analysis highlights locations with safety concerns and identifies the contributing circumstances. Vehicle collision data was obtained from WSDOT, which includes various details about the collisions: type, probable cause, severity, time of day, and weather conditions. Over the five-year study period, there were a total of 467 collisions in the study area.

The project team calculated collision rates for intersections and roadway segments surrounding the US 2/SR 204/20th Street SE interchange using a methodology developed by the FHWA. The rates were calculated to allow comparison of collision rates between locations in the study area and around the state. The FHWA methodology for calculating collision rates at intersections considers the total number of collisions and average daily traffic (ADT) entering an intersection. This approach allows for an equal comparison between intersections in the study area. The following calculation provides the number of collisions per million entering vehicles (MEV) into the intersection.

$$R = \frac{1,000,000 \times \text{total collisions}}{365 \times \text{number of years of data} \times \text{ADT}}$$

The collision rate calculation for road segments provides the number of collisions per 100 million vehicle miles traveled (MVMT) along a segment, accounting for length of segment and ADT carried.

$$R = \frac{100,000,000 \times \text{total collisions}}{365 \times \text{number of years of data} \times \text{ADT} \times \text{length of roadway}}$$

Similarly, MEV and MVMT rates by collision types and severity were calculated to explore other collision patterns.

Results – FHWA Method

Collision rates per MEVs for intersections and MVMs of travel for road segments surrounding the US 2/SR 204/20th Street SE interchange are summarized in Table 3-20 and Table 3-21.

TABLE 3-20. ANNUAL AVERAGE INTERSECTION COLLISION RATES 2011–2015

Intersection	Type of Collision			5-Year Total	ADT	Collision Rate (per MEV)
	Fatal	Injury	Property Damage Only			
SR 204 and 20th St SE	0	4	6	10	9,330	0.59
SR 204 and Sunnyside	0	12	16	28	36,300	0.42
SR 204 and 9th St SE/10th St SE	0	4	6	10	27,570	0.20
Cavalero Road and 20th St SE	0	0	4	4	18,800	0.12
51st Avenue SE and US 2 ramps	0	0	1	1	3,140	0.17

Note: Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

TABLE 3-21. ANNUAL AVERAGE ROADWAY SEGMENT COLLISION RATES 2011–2015

Segments	Segment Length (mi)	Type of Collision			5-Year Total	ADT	Collision Rate (per 100 MVMt)
		Fatal	Injury	Property Damage Only			
US 2 EB							
I-5 on-ramps to 51st Street SE (Ebey Island) off-ramp	0.9	0	19	41	60	44,010	83.0
51st Street SE (Ebey Island) to SR 204/20th St SE off-ramp	1.1	0	28	59	87	41,400	104.7
SR 204/20th St SE off-ramp to SR 204 on-ramp	0.3	0	0	0	0	13,380	0
SR 204 on-ramp to Bickford Ave off-ramp	1.1	0	6	13	19	14,760	64.1
Bickford Ave off-ramp to Bickford Ave on-ramp	0.6	0	8	12	20	8,820	207.1
Bickford Ave on-ramp to SR 9	0.6	1	1	9	11	9,390	107.0
US 2 WB							
SR 9 to Bickford Ave on-ramp	1.5	0	6	17	23	9,670	86.9
Bickford Ave on-ramp to SR 204 off-ramp	0.5	0	0	3	3	16,530	19.9
SR 204 off-ramp to SR 204/20th St SE on-ramp	0.5	0	3	6	9	11,520	85.6
20th St SE on-ramp to 20th St SE (Ebey Island) off-ramp	0.2	0	4	2	6	22,610	72.7
20th St SE (Ebey Island) off-ramp to 51st St SE (Ebey Island) on-ramp	1.0	0	5	15	20	21,310	51.4
51st St SE (Ebey Island) on-ramp to I-5/California St/Walnut St off-ramps	0.9	1	35	58	94	22,150	258.4
US 2 EB Ramps							
51st St SE (Ebey Island) off-ramp	0.26	0	0	2	2	2,610	161.5
SR 204 NB on-ramp	0.41	0	3	2	5	18,320	36.5
20th St SE off-ramp	0.33	0	2	0	2	9,700	34.2

Segments	Segment Length (mi)	Type of Collision			5-Year Total	ADT	Collision Rate (per 100 MVMt)
		Fatal	Injury	Property Damage Only			
SR 204 SB on-ramp	0.46	0	0	0	0	1,380	0
Bickford Ave off-ramp	0.33	0	0	3	3	5,940	83.9
Bickford Ave on-ramp	0.30	0	0	0	0	570	0
US 2 WB Ramps							
Bickford Ave on-ramp	0.74	0	2	1	3	6,860	32.4
SR 204 NB off-ramp	0.32	0	1	0	1	5,010	34.2
SR 204 SB on-ramp	0.18	0	23	19	52	6,710	2359.1
20th Street SE on-ramp	0.19	0	1	2	3	4,380	197.5
Between 204/20th and US 2 ramp	0.15	0	18	30	48	11,090	1581.1
20th Street SE (Ebey Island) off-ramp	0.15	0	0	0	0	440	0
51st Street SE (Ebey Island) on-ramp	0.22	0	3	0	3	840	889.5
Other Roadway Segments							
SR 204 from 20th St SE to 81st Ave NE	1.43	1	51	84	136	32,560	160.0
Sunnyside Blvd from SR 204 to 4th St SE	0.81	0	7	8	15	8,240	123.1
20th St SE from 51st Ave SE to 79th Ave SE	1.75	0	31	33	64	16,900	118.6

Note: Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

Based on a previous study done by the University of Wisconsin for the Wisconsin Department of Transportation (WisDOT), the average collision rate for intersections that share similar characteristics as those evaluated in the study area is 0.82 MEV (WSDOT does not have statewide intersection collision rate data). These characteristics include intersections with 25,000 or more average daily entering volumes and located in incorporated areas. For intersections with fewer than 15,000 daily entering vehicles (e.g., SR 204/20th Street SE and 51st Avenue SE/US 2 ramps), the average collision rate is 1.33. So, none of the studied intersections have rates higher than the average collision rate for these types of intersections.

Snohomish County averages about 236.0 collisions per 100 million vehicle miles traveled according to the 2015 Statewide Annual Collision Summary published by WSDOT. The segments in the study area with collision rates equal to or greater than the county average are the following:

- The US 2 WB segment between the 51st Street SE (Ebey Island) on-ramp and I-5 off-ramps (258.4 MVMt)
- The SR 204 on-ramp to US 2 WB (2359.1 MVMt)
- The segment between the SR 204/20th Street merge and the merge with the US 2 mainline (1581.1 MVMt)
- The 51st Street SE on-ramp to US 2 WB (889.5 MVMt)

These locations match those where existing traffic congestion has been observed. Additional anecdotal evidence provided by the general public (Appendix C) concurs with these data and observations.

The detailed reports indicate that of the 467 collisions reported in the study area, approximately 33 percent were injury collisions and approximately 50 percent of all the collisions were rear-end collisions, mostly attributable to merging and diverging. Additional study area collision statistics are summarized in Table 3-22.

TABLE 3-22. COLLISION SUMMARY STATISTICS

Category	Number	Percent of Total*
Rear-end collisions	235	50
Single-vehicle collisions	87	19
Exceeding reasonably safe speed	50	11
Under influence of alcohol/drugs	22	5
Bike collisions	0	0
Ped collisions	3	1
Injury collisions	153	33
Fatal collisions	0	0
Nighttime collisions	110	24
Wet/ice/snow conditions	172	37
Total collisions in study area	467	100
* Column sums to more than 100% because several collision characteristics can occur simultaneously.		

Note: Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

In addition to the FHWA method, the consultant team calculated existing and future 2040 collision rates for 12 freeway segments and ramps along US 2 and SR 204 using the Enhanced Interchange Safety Analysis Tool (ISATe) methodology developed by the FHWA and AASHTO. The rates were calculated to allow comparison of collision rates between locations in the study area and around the state. In addition to the FHWA method, the methods identified in the AASHTO Highway Safety Manual (HSM) were also applied to five arterial street segments and five intersections using the HSM spreadsheet for urban and suburban arterials.

3.4.2 Analysis Tools

Enhanced Interchange Safety Analysis Tool (ISATe)

The ISATe is a tool that uses the freeway and interchange methodologies developed for the HSM to understand how geometric design alternatives impact safety. Inputs include detailed freeway geometry, location of ramps, annual average daily traffic (AADT), and current collision data. It calculates predicted crash frequency for fatal and injury collisions (KABC), and total collisions including property damage only (KABCO). The “KABCO” injury scale was developed by the National Safety Council and is used to classify injuries accordingly:

- K – Fatal
- A – Incapacitating injury
- B – Non-incapacitating injury
- C – Possible injury
- O – No injury/property damage only

This tool was used for these study segments:

- US 2 from 51st Street to US 2/SR 204/20th Street SE interchange
- US 2 from 51st Street to US 2/SR 204/20th Street SE interchange merge/diverge
- US 2 from US 2/SR 204/20th Street SE interchange to Bickford Ave
- US 2 from US 2/SR 204/20th Street SE interchange to Bickford Ave merge/diverge
- US 2 WB from SR 204 N off-ramp to SR 204 S on-ramp
- US 2 WB from 20th Street SE on-ramp to 20th Street SE off-ramp
- US 2 EB SR 204 NB on-ramp
- US 2 EB 20th Street SE off-ramp
- US 2 EB SR 204 SB on-ramp
- US 2 WB SR 204 SB on-ramp
- US 2 WB between SR 204/20th Street SE and US 2
- US 2 WB 20th Street SE on-ramp

Highway Safety Manual (HSM)

The HSM spreadsheet tool for urban and suburban arterials was used to analyze expected and predicted crash frequency for arterial roadways near the US 2/SR 204/20th Street SE interchange. Inputs include roadway geometry and type, intersection control type, AADT, presence of lighting, number of intersecting driveways, and roadside fixed object density. It calculates expected and predicted average crash frequency for fatal and injury collisions (KABC), and total collisions including property damage only (KABCO) as described in the above ISATe tool.

This tool was used for these study segments and intersections:

- 20th Street SE:
 - SR 204 to Cavalero Rd/75th Ave S
 - Cavalero Rd/75th Ave S to 79th Ave SE/Fairview Dr
 - 79th Ave SE/Fairview Dr to 83rd Ave SE
 - Intersection of 20th Street SE and 75th Ave S
 - Intersection of 20th Street SE and 79th Ave SE
 - Intersection of 20th Street SE and 83rd Ave SE

- SR 204:
 US 2 to Sunnyside Blvd SE
 Sunnyside Blvd SE to 9th Street SE
 Intersection of SR 204 and Sunnyside Blvd SE
 Intersection of SR 204 and 9th Street SE

3.4.3 Collision Analysis – No-Build

Roadway information was entered into the ISATe and HSM spreadsheets for comparison with forecasted no-build conditions in 2040. Detailed HSM and ISATe results are provided in Appendix H. Table 3-23 provides a summary of the predicted average crash frequency calculated for the no-build scenario compared to the existing rate. The segments correspond to those listed previously in section 3.4.2.

TABLE 3-23. SUMMARY OF ANTICIPATED SAFETY PERFORMANCE FOR EXISTING AND 2040 NO-BUILD

Collision Analysis – Predicted Collision Totals		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing	59.2	19.8
2040 No-Build	105.4	32.4
Collision totals include intersections, segments, ramps, and merge/diverge points		
US 2/SR 204/20th Street SE Interchange – ISATe		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing	39.9	13.3
2040 No-Build	73.2	21.5
20th Street and SR 204 – HSM		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing – 20th Street SE	9.3	3.0
2040 No-Build – 20th Street SE	19.9	6.6
Existing – SR 204	10.0	3.6
2040 No-Build – SR 204	12.3	4.3

Note: Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

The predicted average crash frequency for all areas increased in the 2040 no-build scenario. This is expected as AADT increases in the future and this is a major input in the ISATe and HSM calculations.

3.4.4 Collision Analysis – PPA

After analyzing the 2040 no-build scenario, roadway information was entered into the ISATe and HSM spreadsheets for comparison with the 2040 PPA. Detailed HSM and ISATe results are provided in Appendix D. Table 3-24 summarizes the predicted average crash frequency calculated for the PPA compared to the existing and 2040 no-build rates. The segments correspond to those listed in Section 3.4.2.

TABLE 3-24. SUMMARY OF ANTICIPATED SAFETY PERFORMANCE

Collision Analysis – Predicted Collision Totals		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing	59.2	19.8
2040 No-Build	105.4	32.4
2040 PPA	100.4	32.4
Collision totals include intersections, segments, ramps, and merge/diverge points		
US 2/SR 204/20th Street SE Interchange – ISATe		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing	39.9	13.3
2040 No-Build	73.2	21.5
2040 PPA	68.1	21.4
20th Street SE and SR 204 – HSM		
Scenario	Predicted Average Crash Frequency (crash/yr)	
	Fatal & Injury	Property Damage Only
Existing – 20th Street SE	9.3	3.0
2040 No-Build – 20th Street SE	19.9	6.6
2040 PPA – 20th Street SE	19.7	6.6
Existing – SR 204	10.0	3.6
2040 No-Build – SR 204	12.3	4.3
2040 PPA – SR 204	12.6	4.4

Note: Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

For the PPA, overall predicted average crash frequency increased from existing conditions due to the predicted increase in AADT on the roadway network as shown in the no-build alternative. However, the total predicted number of fatal, injury, and property damage only crashes (KABCO) in the PPA decreased from the 2040 no-build scenario, while predicted fatal and injury crashes were approximately equal. The reduction in crashes compared to no-build is a function of the PPA geometric improvements that include improved sight distance on the ramps, wider lanes, and wider shoulders. Additional evaluation could be performed during the design phase to understand how improved illumination might reduce the number

of crashes. The total predicted fatal and injury crashes (KABCO) on SR 204 did increase very slightly from the no-build scenario, which is due to changes forecasted AADT surrounding the newly constructed interchange. The change in crashes of 0.3 is not considered to be statistically significant. As noted above, the design team would look for additional improvements on the corridor to mitigate even this small increase.

3.4.5 Disclaimer

Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

3.5 CONCEPTUAL SIGNING PLAN

Figure 3-24 shows the conceptual signage plan for the US 2/SR 204/20th Street SE interchange. Note that this is intended to communicate potential locations that may require additional information for drivers. During the engineering design phase, a thorough analysis should be conducted, and a full traffic control plan should be completed in concurrence with the applicable edition of the MUTCD.

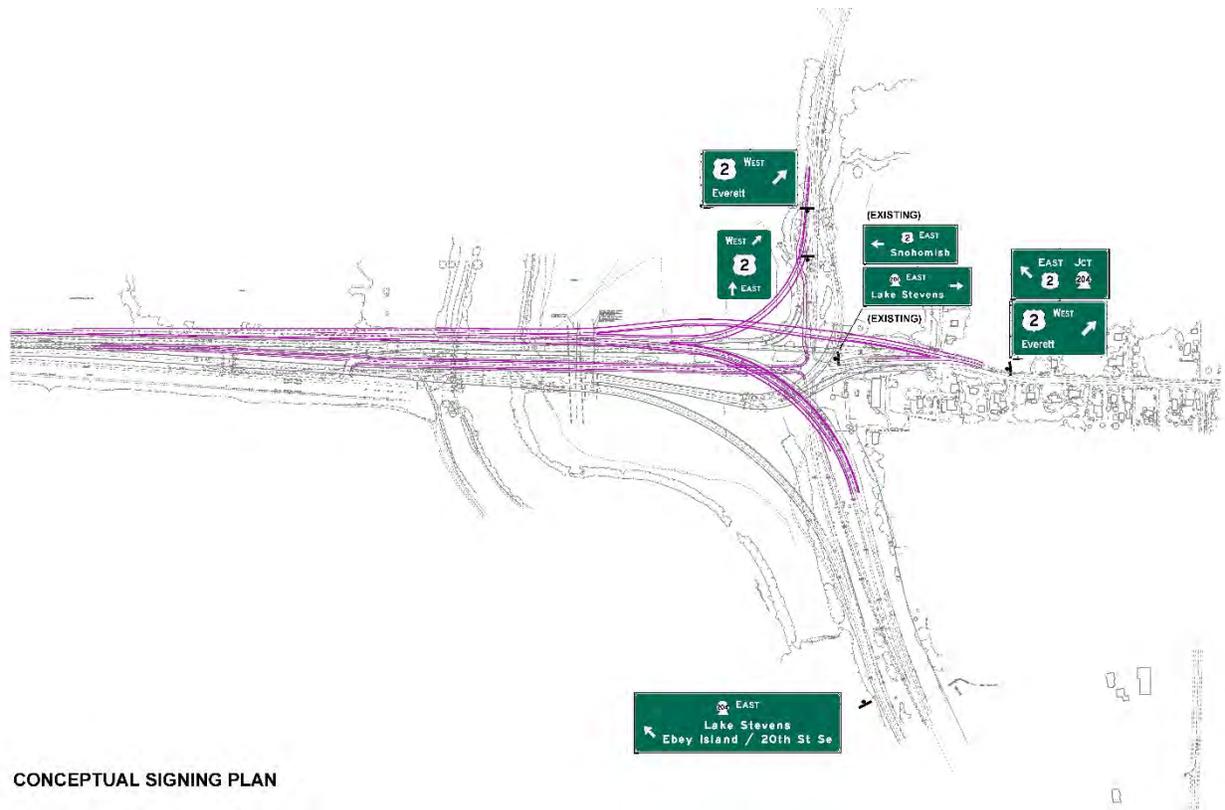


Figure 3-24. Conceptual Signing Plan

Additional route decision signs may be useful for traffic mitigation at a location such as SB SR 9 north of SR 528. Route decision signs could provide estimate time to Everett via SR 9 / US 2 vs SR 520/15.

Sign locations are schematic and are not laid out to scale.

3.6 BICYCLE AND PEDESTRIAN NETWORK

The proposed modification to the US 2/SR 204/20th Street SE interchange will include existing bicycle and pedestrian network improvements. Identified options for connecting the existing network and ensuring continuity through the project area include the following:

- Grade-separated crossing under the US 2 on-ramp from SR 204.
- Possible pedestrian accommodation at SR 204/Sunnyside Boulevard or SR 204/9th Street SE.
- Consideration to not preclude future shoulder/shared-use lane access along the US 2 EB on-ramp from SR 204 to Bickford Avenue.
- Consideration to not preclude future shoulder/shared-use lane access along the US 2 WB on-ramp from SR 204 across the US 2 trestle.
- Consideration to not preclude future bicycle path from US 2 WB to 20th Street SE.

The design of any modification or addition to the existing bicycle or pedestrian networks will be revisited during engineering design of the interchange improvements. A concept diagram is provided in Figure 3-25.

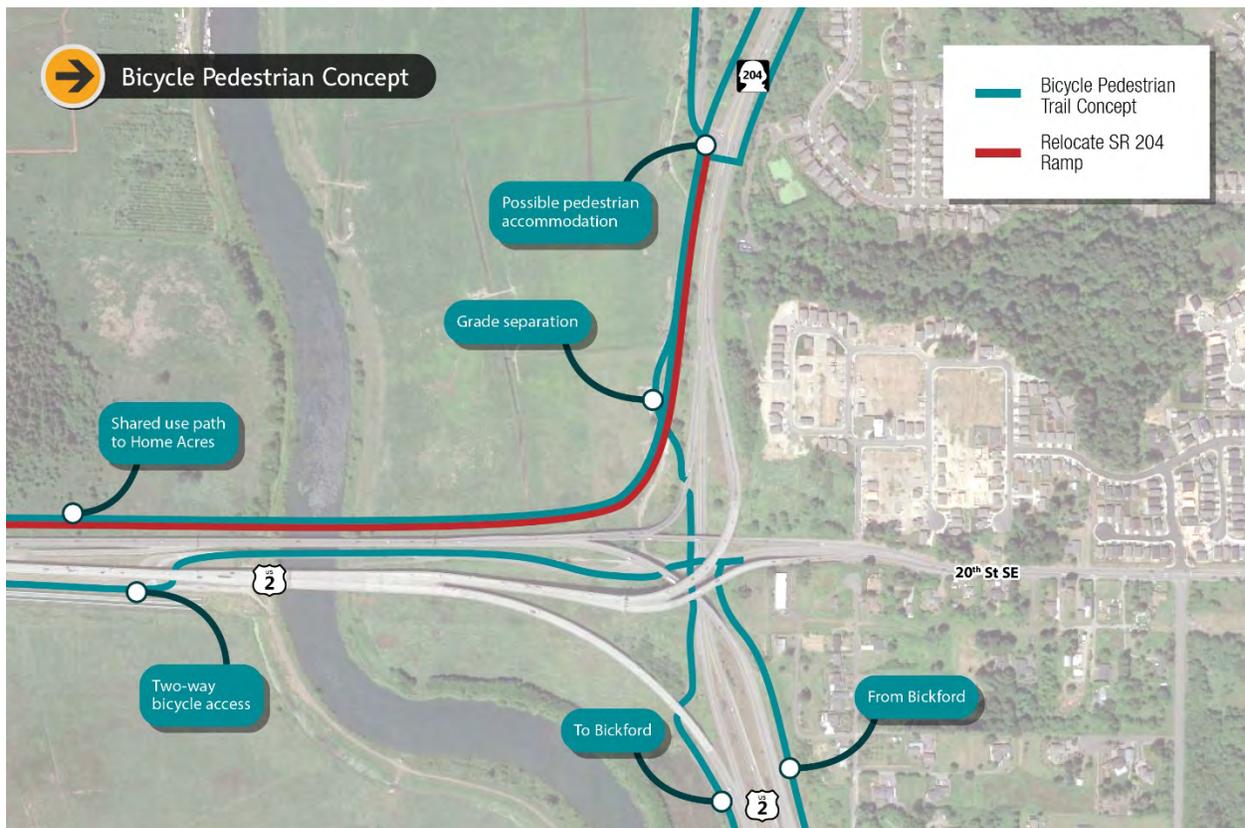


Figure 3-25. Nonmotorized Network Improvements

POLICY POINT 4. ACCESS CONNECTIONS AND DESIGN

Will the proposal provide fully directional interchanges connected to public streets or roads, spaced appropriately, and designed to meet the identified performance needs?

The proposed access connects to a public road only and will provide for all traffic movements. Less than “full interchanges” may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).

4.1 RIGHT-OF-WAY

The proposed layout for the PPA falls outside WSDOT ROW, as depicted in Figure 4-1. ROW acquisition will be pursued during the design phase following approval and funding of the interchange improvements.

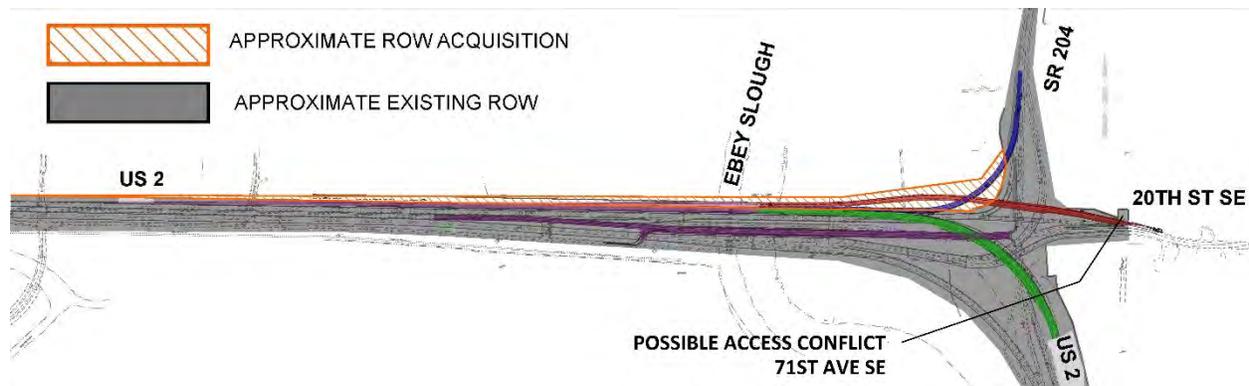


Figure 4-1. Approximate Required ROW

4.2 ACCESS CONNECTIONS

The existing US 2/SR 204/20th Street SE interchange provides access to US 2 from SR 204 and 20th Street SE, both public roads. Figure 4-2 shows a schematic diagram for the existing interchange.

SR 204 begins at the US 2/SR 204/20th Street SE interchange, and WB SR 204 traffic can currently access both WB and EB US 2. WB traffic on 20th Street SE can access US 2 via shared on-ramps with SR 204. EB traffic from Ebey Island on 20th Street SE can access US 2 EB; an additional access point for Ebey Island traffic to reach US 2 WB is provided at the west end of the US 2 trestle. EB US 2 provides a split off-ramp to SR 204 EB and 20th Street SE EB. WB US 2 provides an off-ramp to the existing SR 204/20th Street SE intersection.

The proposed interchange improvements will maintain access to and from all existing traffic movements. The upstream off-ramp from EB US 2 to Ebey Island will be maintained. The downstream off-ramp from US 2 WB to Ebey Island will be eliminated, as the SR 204/20th Street SE intersection will now provide access to Ebey Island. See Figure 4-4 for a schematic diagram of the proposed access configuration. Figure 4-5 shows that the westbound US 2 off-ramp to Ebey Island is relocated to the lower roadway (20th Street SE).

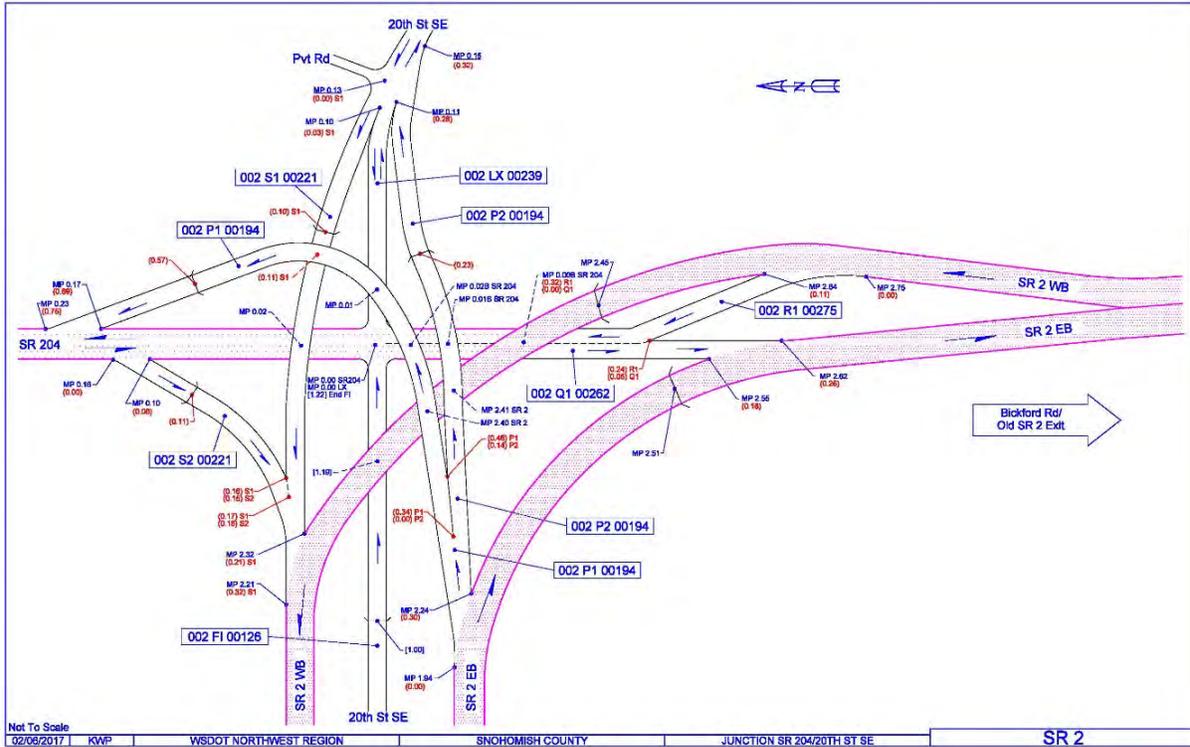


Figure 4-2. Existing SR 204/20th Street SE Access

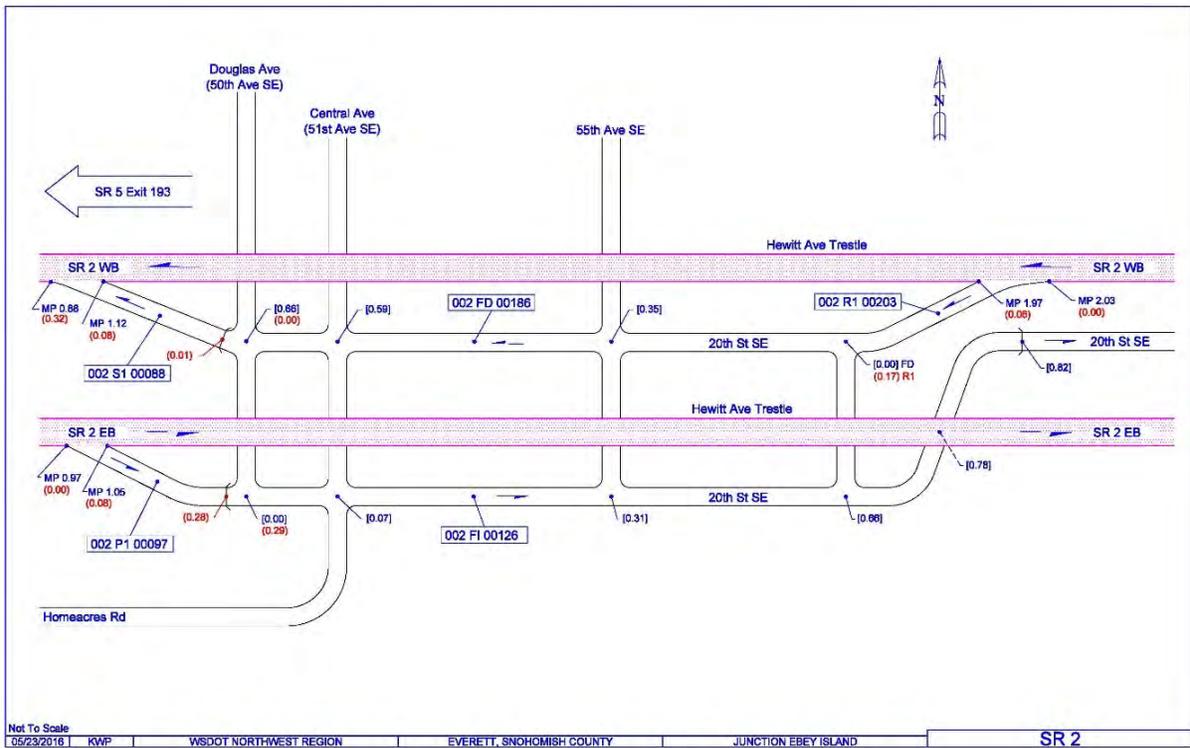


Figure 4-3. Existing Ebey Island Access

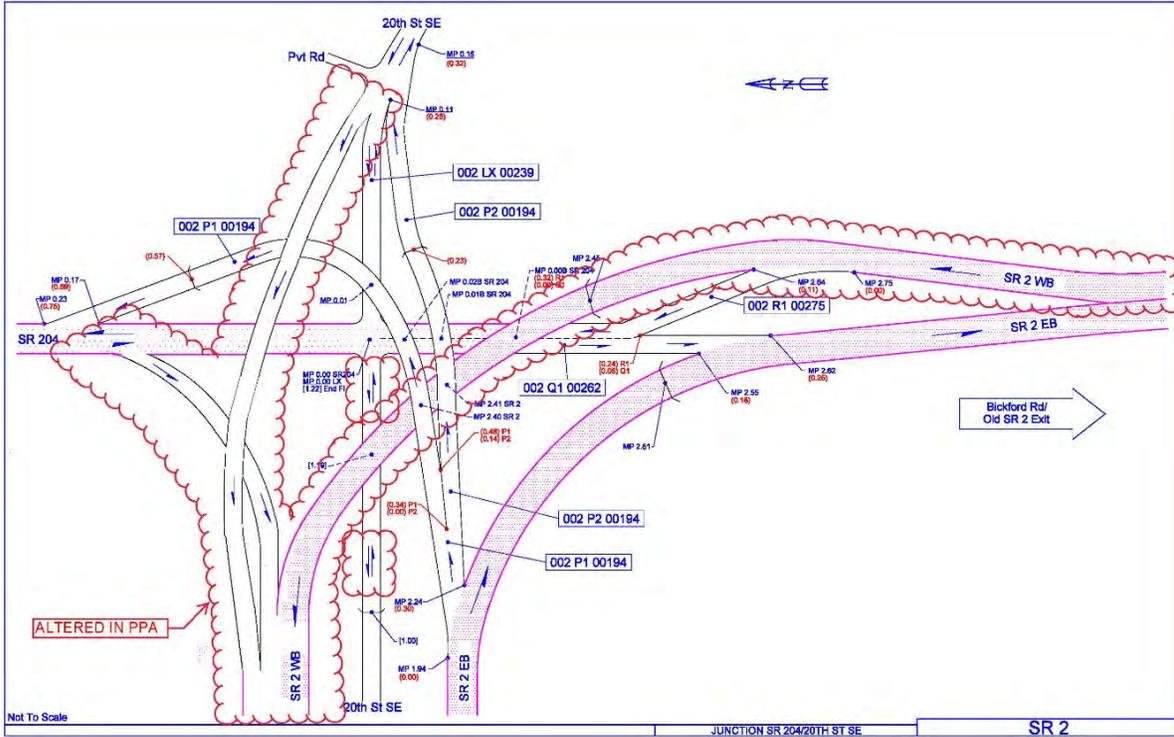


Figure 4-4. Proposed SR 204/20th Street SE Access

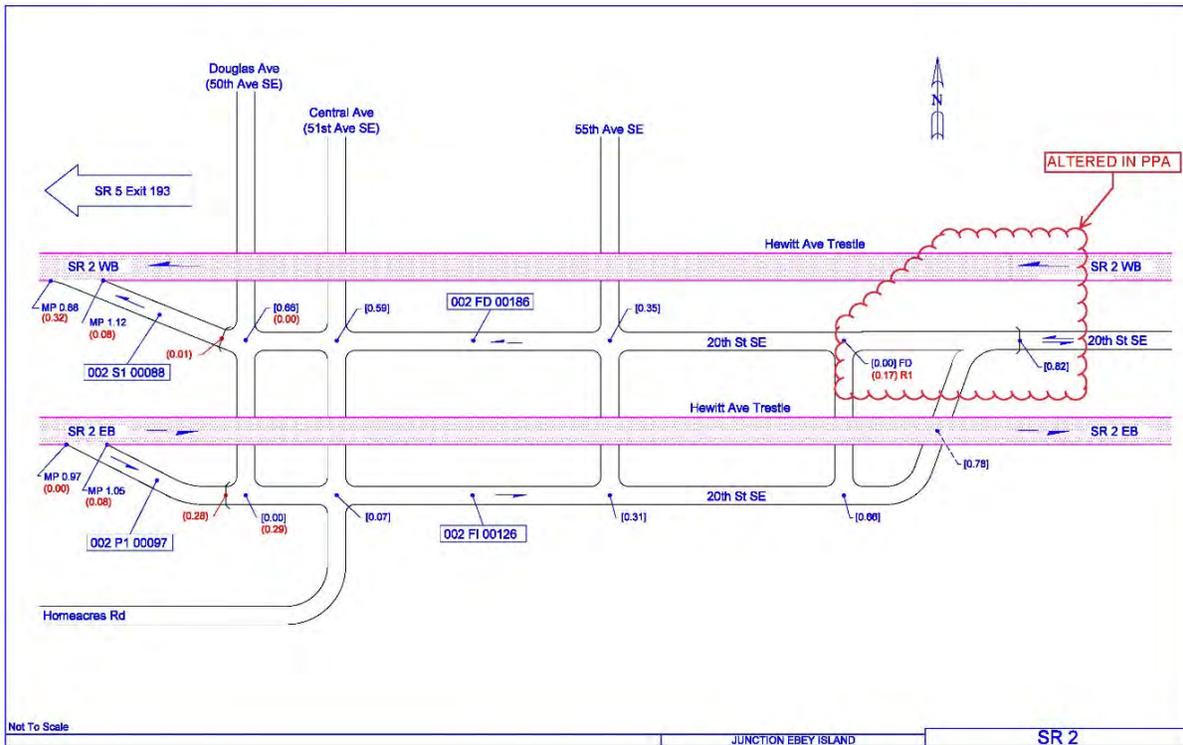


Figure 4-5. Proposed Ebey Island Access

4.3 CONSTRUCTION SEQUENCING AND INTERCHANGE PHASING

The US 2/SR 204/20th Street SE interchange was evaluated in this IJR based on assumptions with respect to the future US 2 trestle configuration. The final interchange configuration was operationally analyzed for the year 2040 to determine its longer-term functionality. The design and construction of the interchange could occur much sooner than the year 2040, and the future US 2 westbound trestle replacement project could be operational at different phases of construction. This could result in various lane configurations that would require strategies for operations of the new interchange. To understand how the study interchange could interface with the US 2 trestle, the IJR study team developed a potential construction sequencing concept that could interface with the existing US 2 trestle configuration. The team also developed various line diagram and cross section concepts that could interface with longer term lane management strategies on a new westbound US 2 trestle.

4.3.1 Construction Sequencing

The following construction sequence assumes that funding to construct all or part of the study interchange would be available prior to replacement of the westbound US 2 trestle. This construction sequencing concept provides insight into the potential sequence of construction and costs that would provide some early benefits for traffic mobility and safety at the interchange. This work was completed based on planning level design that provides enough high-level information to develop the WSDOT Planning Level Cost Estimate. Figure 4-6 shows the planning level cost estimate data.



Figure 4-6. Planning Level Cost Estimate

The following key assumptions were included in this design and cost estimate that would be considered further during the practical design portion of the project:

1. Full reconstruction of the lower roadway (20th Avenue SE) was assumed with corresponding environmental mitigation.
2. A new nonmotorized connection was provided between Sunnyside Boulevard and the lower roadway.
3. A fish passage culvert would require replacement on the SR 204 leg of the interchange.
4. Design assumptions for lane and shoulder widths were based on moderate practical solutions application at this level.

The following represents a likely construction sequence of the preliminary preferred alternative:

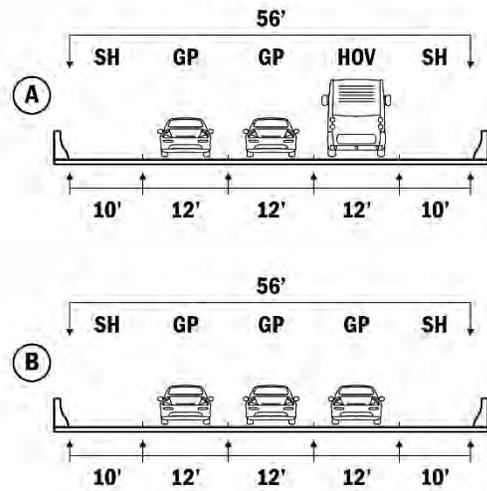
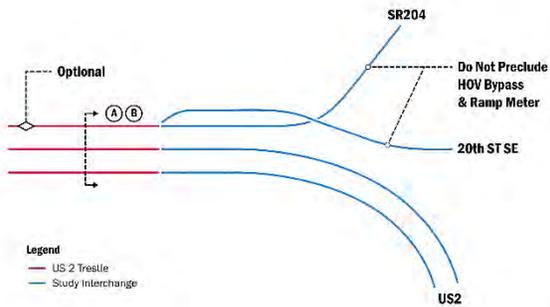
1. Construct portion of new WB trestle over Ebey Slough, build new SR 204 ramp, and construct temporary connection bridge to existing trestle. Provide shared-use path connection from SR 204 to lower roadway.
2. Construct lower roadway (20th Street SE) to provide two-way access to Ebey Island. Relocate the WB off-ramp from US 2 to Ebey Island to the intersection of SR 204 and 20th Street SE.
3. Build 20th Street SE ramp to new trestle and adjust tapers on temporary bridge (striping).
4. Construct US 2 two-lane ramps to tie into new trestle. Adjust tapers on temporary bridge (striping). Consider how to facilitate HOV connectivity, if available.

Figure 4-9 shows a possible construction sequencing concept.

Additional preliminary design layout has been completed to develop a preliminary understanding of the extent of construction necessary to open the full interchange and connect with the existing trestle. This layout is presented in the conceptual design notes in section 4.7 and also applies to the phased layout.

4.3.2 Interchange Phases

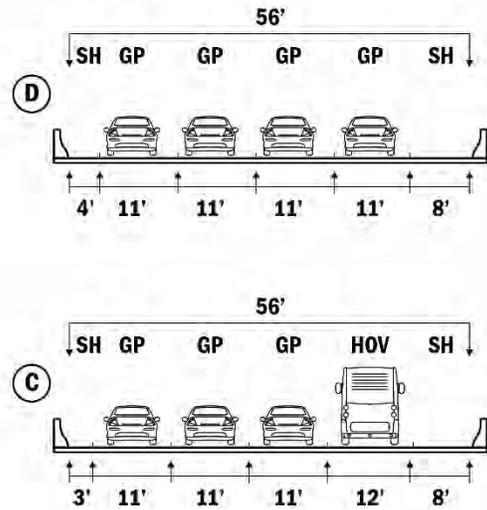
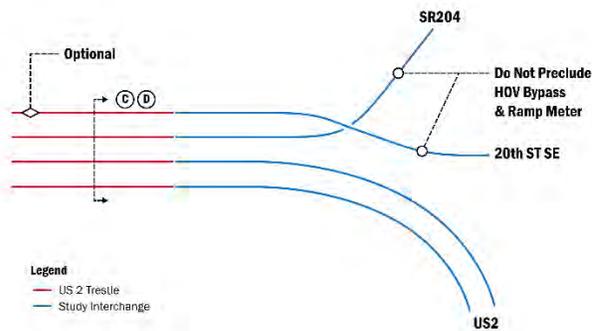
The final design of the replacement for the westbound US 2 trestle has not been determined. The final trestle design may be either three or four lanes, but would be designed to accommodate at least peak period operations of a four-lane cross section that could serve three GP lanes and one HOV lane. Figure 4-7 and Figure 4-8 illustrate the cross sections and possible lane configuration on the US 2 trestle for possible construction phasing options for the study interchange. This consideration was made to ensure that the project would be forward compatible with future decision for the US 2 west trestle replacement.



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Figure 4-7. Three-Lane Trestle Connection



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Figure 4-8. Four-Lane Trestle Connection

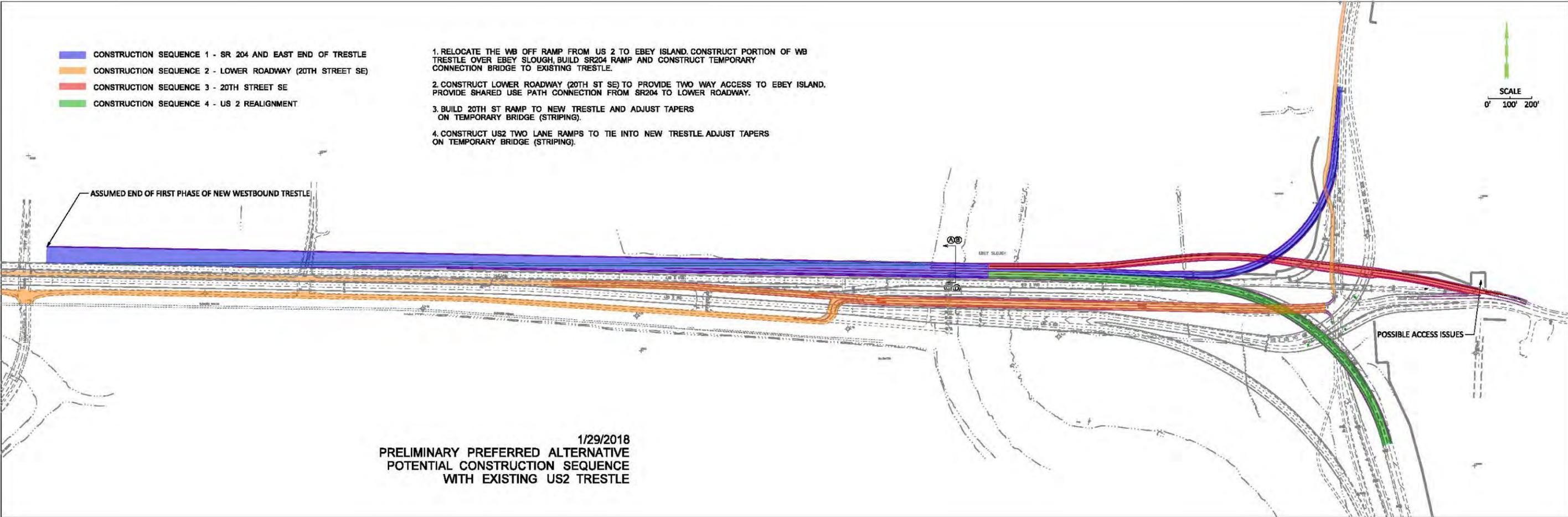


Figure 4-9 Potential Construction Sequence

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4.4 DESIGN YEAR SELECTION

4.4.1 Opening Year

The expected opening year for the proposed interchange improvements is 2025. This year was used in a separate Funding and Finance study¹ conducted in parallel with this IJR. It was determined that this is a reasonable date to expect completion of construction of the PPA. The replacement of the WB US 2 structure across the Ebey Island is not expected to be completed by 2025. The design assumes that the US 2/SR 204/20th Street SE interchange will be constructed to align with the new structure upon completion; temporary pavement will be in place to connect the improved interchange with the existing structure.

4.4.2 Design Year

The design year for operational analysis is 2040. This aligns with the PSRC Transportation 2040, enabling completion of all currently planned and funded transportation projects. This also corresponds with the expected replacement date of the WB US 2 trestle across the Ebey Island, as the life expectancy of the existing structure is 2045.

4.4.3 FHWA Support

The FHWA NW Region area engineer was included in official IJR Support Team correspondence, including invitations to Support Team meetings and final documents for review. The Methods and Assumptions document, Appendix A, documents the opening and design years. This document was provided electronically for review by the IJR Support Team; no feedback was received regarding design year or design criteria from the FHWA representative.

4.5 DESIGN CRITERIA

This section highlights the considerations that should guide further development of design criteria during the preliminary design phase. Operational measures of effectiveness that should be used in design evaluation are presented in accordance with the needs of the project, and preliminary design controls are outlined in accordance with WSDOT Design Manual requirements.

4.5.1 Goals

Operational goals were established in Policy Point 1; these goals are repeated in Table 4-1. Analysis discussed in Policy Point 3 outlines the ability of the preliminary design to meet these goals. When the design is advanced following approval and funding of the US 2/SR 204/20th Street SE interchange improvements, it shall be completed so that all design elements are able to meet or exceed the expected operational performance as outlined in this IJR.

¹ "US 2 Westbound Trestle Funding and Finance Study" (Bill ESB 5096 (2017-18), 2018)
<http://app.leg.wa.gov/ReportsToTheLegislature/Home/>

TABLE 4-1. OPERATIONAL IMPROVEMENT MOE AND GOALS

Facility	MOE	Units	Goal (Peak Hour)
Intersections	LOS	A-F	D
	Average vehicle delay	min	Directly related to LOS
	95th-percentile queues	ft	Reduced compared to no-build
Freeway segments	LOS	A-F	D
	Density	VPLPM	Directly related to LOS
	Speed	mph	Directly related to LOS
	Queues	ft	Reduced compared to no-build
Corridor(s)	Average travel time (by mode)	min	Reduced compared to no-build
	Average travel speed	mph	Increased compared to no-build
	Queues	ft	Reduced compared to no-build

4.5.2 Design Controls

Design controls help to set the boundaries for the designers to follow during each phase of the design. In this early phase of concept feasibility, the design controls are developed to provide general guidance while not constraining the designers unless clear direction has been given by jurisdictions or the project context warrants tighter boundaries. Neither of the more constrained guidance was given on this phase of the design; however, knowing that there are environmentally sensitive areas adjacent to the study interchange, the design team worked to reduce impacts to right-of-way while providing improved safety and operations at the interchange. Table 4-2 presents the design controls considered by the designers as they developed the preliminary preferred alternative design.

4.5.3 Design Criteria

A conceptual/planning level design (Figure 4-10) was developed for feasibility and operational analysis. The design has not been advanced to a level that would enable definition of design criteria or analysis of the design.

TABLE 4-2. PRELIMINARY DESIGN CONTROLS

Control		Proposal	Justification
Design year	Opening year	2025	Aligns with funding & finance study
	Design year	2040	Aligns with Transportation 2040 and replacement of WB trestle
Modal priority	Design users (Modal accommodation level)	Motorized vehicles (high) Transit (high) Bicyclists (low) Pedestrians (low)	On and off-ramps serve motorized vehicles (including trucks) and transit. Local network connections serve bicycles and pedestrians as well.
	Modal priority	Motorized vehicles, transit	Based on traffic count data and existing transit routes
	Design vehicle	WB 62 (SR 204) BUS 45 (20th Street SE)	Based on existing truck and transit routes
Access control		Full limited	
Design speed	Access ramps Mainline	Intermediate High	WSDOT DM Exhibit 1103-4
Terrain classification		Rolling	

4.6 DESIGN STANDARDS

The following standards represent some of the guidance pertinent to design of the US 2/SR 204/20th Street SE interchange. This is not a comprehensive list; additional resources may be required during the design and construction phase.

- A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, current edition
- Highway Capacity Manual (HCM), latest edition, Transportation Research Board, National Research Council
- Local Agency Guidelines (LAG), M 36-63, WSDOT
- Manual on Uniform Traffic Control Devices for Streets and Highways, USDOT, FHWA; as adopted and modified by Chapter 468-95 WAC “Manual on uniform traffic control devices for streets and highways” (MUTCD)
- WSDOT Design Manual, M 22-01.13
- Plans Preparation Manual, M 22-31, WSDOT
- Standard Plans for Road, Bridge, and Municipal Construction (Standard Plans), M 21-01, WSDOT
- Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specifications), M 41-10, WSDOT

4.7 CONCEPTUAL DESIGN

This section outlines key assumptions made in developing the planning-level conceptual design of the preliminary preferred alternative as illustrated in Figure 4-10.

A. WB trestle key points and assumptions:

- To provide the best benefit for constructability and minimum interim construction, it is assumed that US 2/204 IJR project will be built before or at the same time as the WB trestle.
- If the US 2/SR 204/20th Street SE interchange is built first, minimum interim pavement can be ensured when the proposed ramp configurations are fully built as most of it is off alignment and the WB trestle is built up to west of Ebey slough before tapering back to existing. This will help in keeping the existing ramps open during construction.
- In the full built condition, start HOV lane WB trestle 2000 feet after the 3 ramp movements come together at the study interchange. HOV lane weave assumed to be like "type A " on-off weaving; see DM Exhibit 1360-3

B. WB SR 204 to WB US 2 Ramp:

- Existing ramp posted speed = 30mph; sight distance for solid barrier = 25 mph. The ramp currently has a guardrail.
- Proposed Design:
 - SB SR 204 DS assumed = 55 mph
 - On-ramp DS assumed = 40 mph (to minimize ROW take while providing safe connection speeds between highways)
 - Assumed one 13-foot lane; 8-foot and 2-foot outside and inside shoulders (per WSDOT Design Manual Exhibit 1360-6)
 - $e_{max} = 8\%$ assumed (urban area with possible icy conditions); R minimum = 590 feet
 - 12-foot inside shoulder required to meet 40-mph sight distance
 - Standard shoulder width of 8 feet meets 35-mph sight distance

C. Ebey Island off-ramp closed

- Two-way access provided by building new two-way structure connecting 20th Street SE
- Assumed 12-foot lane with standard 8-foot shoulders on WB 20th Street SE west of Ebey slough
- Per Exhibit 1239-9, used 2-foot curb and gutter, and 5-foot sidewalks on structure. Sidewalk width on structure per Exhibit 1510-7.
- Per Exhibit 1239-1, used 8-foot shoulders and 12-foot sharrow lanes outside of structure. No additional lane widths assumed for sharrows.
- Further design necessary to develop drainage and storm water needs.

D. WB US 2 to WB trestle ramp:

- 26-foot two-lane turning roadway width (per Exhibit 1240-2a) with 8-foot and 4-foot outside and inside shoulders; R = 965 feet minimum (55 mph)
- 8-foot standard shoulder width was used for design and meets 45-mph sight distance; to achieve 55-mph site distance, an additional 17-foot widened shoulder would be required

- Based on visual inspection (google maps) and pier locations noted on trestle CAD files provided, it appears that two lane WB on from US 2 may likely be accommodated between the EB piers if built on same alignment as existing.
- Other options would be to widen existing ramp to accommodate two lanes or split lanes around EB US 2 piers and build off alignment.
- Existing WB US 2 can be restriped for two lanes (26 feet wide) and 2-foot shoulders. Sight distance will be 35 mph.

E. 20th Street SE On-Ramp:

- HOV lane shown in drawing to determine layout to not preclude future construction.
- HOV bypass designed per WSDOT Design Manual Exhibit 1410-4a
- Two 24-foot-wide lanes reduced to one 15-foot lane before merging with trestle. The 15-foot width will be reviewed during the design phase to possibly reduce width and impact.
- 20th Street SE ramp will merge as an add lane to WB trestle
- Ramp meter operational only during peak AM periods

F. Shared use path connection

- Provided a shared used path with minimum 10-foot-wide paved area with 2-foot shoulders on either side.

G. Min Gore spacing

- Required 1,000-foot spacing per Exhibit 1360-3.
- This is not really a true merge condition as each on-movement gets its own lane on WB trestle and has standard distance for weaving to occur before the start of HOV lane.

4.7.1 Profile

Vertical profile assumptions:

- Most ramps will follow existing under over configurations.
- 20th Street SE ramp will go over EB US 2/EB SR 204 ramp (high point) and rise over existing and proposed SR 204 on-ramp before diving down to merge with WB trestle.

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Figure 4-10 Preliminary Preferred Alternative Layout

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POLICY POINT 5. LAND USE AND TRANSPORTATION PLANS

Is the proposed access point revision compatible with all land use and transportation plans for the area?

The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

5.1 SUMMARY

The US 2/SR 204/20th Street SE interchange is located in Snohomish County, Washington. The interchange is 2 miles east of I-5 and lies at the seam of riverway farmland, rural residential, and a rural-urban transition zone at the corner of the City of Lake Stevens urban growth area. Due to its geographic situation, no significant further development is anticipated in the adjacent lands west of the interchange.

The study interchange is the link between smaller population centers in eastern Snohomish County and the larger city of Everett to the west. It also provides access to I-5, a primary north-south corridor connecting the major cities of Washington State.

This regionally significant interchange is within the jurisdiction of the PSRC and WSDOT Northwest. All applicable land use and transportation plans have been reviewed, including state and regional plans as well as those of nearby localities.

The proposed interchange improvements meet the needs of all affected municipalities while progressing the goals set forth in regional and statewide policy.

5.2 COMPREHENSIVE AND LAND USE PLANS

5.2.1 Washington State Growth Management Act

The Washington State Growth Management Act (GMA) was established in 1990 to guide local agencies in establishing comprehensive plans and land use regulations, and to improve planning coordination and consistency between state, county, and local agencies. Regional, county, and state agencies are required to maintain land use plans that comply with the policies set forth in the GMA, which include concentrating growth in urban centers, sustainable economic development, and community involvement in planning. The GMA especially places an emphasis on concurrency, to ensure that public facilities, including transportation systems, are maintained to support growth-generated demand as it is created without allowing systems to fall below established acceptable levels of service. Although state highways are exempt from this criterion, the intent remains to place an emphasis on anticipating and supporting demand rather than waiting for shortfalls to become a reality. Additionally, the GMA requires a Regional Transportation Planning Organization to ensure consistency between county and city planning policies.

The improvements to the US 2/SR 204/20th Street SE interchange will maintain compliance with the GMA by incorporating a multi-agency review team and by ensuring consistency with currently adopted regional and local plans.

5.2.2 Regional Land Use Plans

PSRC VISION 2040/Lake Stevens Minor Amendment/PSRC VISION 2040 – Transportation

“VISION 2040 establishes the region’s multicounty planning policies under the Washington State Growth Management Act.”¹⁷ VISION 2040 provides guidance for local governments within the jurisdiction of the PSRC to develop comprehensive plans that are consistent across counties. It consists of “an environmental framework, a regional growth strategy, policies to guide growth and development, actions to be implemented, and measures to track progress.”¹⁸

The PSRC VISION 2040 — Transportation section states specific regional transportation goals and outlines policies to guide decision-making and development, and regional actions to be taken to achieve those goals. Primary goals are “maintenance of the existing transportation system in a safe and usable state; supporting the regional growth strategy by connecting centers with a highly efficient transportation network; and investing in transportation systems that offer greater options, mobility, and access in support of the regional growth strategy.”¹⁹

The US 2/SR 204/20th Street SE interchange improvements incorporate multiple actions required in the PSRC VISION 2040 – specifically advancing strategies for congestion relief and commute trip reduction. Due to the project area being at the connection of an urban area to a rural area, it would not conflict with the goal to avoid roadway expansion in rural areas.

PSRC Regional Growth Strategy

The PSRC Regional Growth Strategy map places the intersection of US 2/SR 204 at the seam of rural and agricultural natural resource lands and the edge of the City of Lake Stevens.²⁰ The Lake Stevens Minor Amendment to VISION 2040 reclassifies Lake Stevens as a “Larger City”. The VISION 2040 plan directs local (county and city) agencies to address growth in their comprehensive plans, reducing growth in rural areas and concentrating it in urban growth areas.

By maintaining consistency with the Snohomish County and the City of Lake Stevens comprehensive plans, improvements will maintain compliance with the land use classification directions set forth in VISION 2040.

5.2.3 Local Land Use Plans

Snohomish County

The Snohomish County Comprehensive Plan includes general policy, transportation element, capital facilities plan, capital improvement program, and parks and recreation. The Comprehensive Plan provides county-specific policy direction in accordance with the goals and requirements set forth in the GMA. Per the Snohomish County Land Use Map, the US 2/SR 204/20th Street SE interchange is located at the

intersection of multiple zones, classified as rural/urban transition area, 5-acre rural residential, and riverway commercial farmland, as well as the border of the City of Lake Stevens urban growth area.

Improvements to the US 2/SR 204/20th Street SE interchange are consistent with the objective to link “significant concentrations of population and employment”, in this case the employment locations in Everett and Seattle drawing large numbers of commuters from Lake Stevens, Monroe and Snohomish along US 2 to I-5 during peak hours. As the interchange is existing, the impact of any improvements on rural and agricultural lands outside the City of Lake Stevens boundary is negligible.

City of Lake Stevens

The 2015 – 2035 City of Lake Stevens Comprehensive Plan provides a framework to manage local growth over the short and long term (5 to 20 years). It forecasts growth specific to the City of Lake Stevens and integrates the Lake Stevens Vision with the policies in the Snohomish County Comprehensive Plan and Washington State GMA. The portion of Lake Stevens adjacent to the project area is designated in the City of Lake Stevens Land Use Map as medium-density residential area, “located in transitional areas between high-density designations and rural areas where infrastructure is readily available.”²¹

The City of Lake Stevens experienced rapid growth during 2000-2010, and continued growth will be accommodated by focusing on urban centers, which include residential and commercial development along the 20th Street SE corridor. The land use immediately adjacent to the US 2/SR 204/20th Street SE interchange will remain zoned for residential use.

The existing interchange location, along the border of the medium-density residential area, is consistent with the intention to maintain infrastructure as readily available. The study interchange provides easy access to US 2 for residents in the area and those transiting through.

City of Everett

The 2035 Everett Comprehensive Plan, updated in October 2015, defines the population distribution and required resources and facilities to support the expected population growth over a 20-year period. It incorporates PSRC VISION 2040, Snohomish County planning policies and City of Everett Vision reports into the policies and programs set forth in the Everett Comprehensive Plan. Through a coordinated effort with City of Everett staff, the project team determined that the long-range growth estimates in the PSRC model were more aggressive than the city believes is reasonably achievable. To adjust for a less aggressive growth, city staff recommended a reduction factor that the team applied to the traffic forecasts. Trips that originated in Everett were reduced by just over 15% and trips that ended in Everett were reduced by just over 6%.

The City of Everett Land Use Element predicts population growth of 35-50 percent by year 2025, and employment growth of 60 percent.

The US 2/SR 204/20th Street SE interchange lies well outside the Everett Municipal Urban Growth Area; however, as a source/destination or waypoint for travelers on US 2, Everett will be affected by any change in transportation flow at the study interchange.

City of Snohomish

The City of Snohomish Comprehensive Plan, signed March 2016, sets forth policy to guide growth and development within the City of Snohomish in the long term (20 years). It incorporates the PRSC VISION 2040 and Snohomish County Planning Policies to address growth while preserving the existing infrastructure and environment.

The City of Snohomish Land Use Element predicts population growth from about 10,000 in 2011 to 14,000 by 2035, approaching their existing land use capacity. No significant expansion of geographic footprint is expected. Employment opportunities are expected to increase proportionally

The US 2/SR 204 intersection, while outside City of Snohomish, is within 2 miles of the city's northern border and any significant changes in congestion patterns will take into account expected land use and population growth within the City of Snohomish boundaries. See the Methods and Assumptions document, Appendix A, for discussion of the travel demand model inputs.

City of Marysville

The City of Marysville 2015 Comprehensive Plan incorporates community vision and values as well as Snohomish County goals to develop a set of policies and regulations for community development over a 20-year period. The plan is based on the GMA and is consistent with the PSRC VISION 2040.

The City of Marysville Land Use Element projects considerable employment growth, from 13,000 to 36,000 job opportunities, over the comprehensive plan forecast period (forecast year 2035). Their plan includes measures to encourage business growth in the city, particularly in the Smokey Point planning area.

The significant employment growth anticipated in the City of Marysville may draw some traffic from the City of Lake Stevens and immediately surrounding area north along SR 9 toward Marysville rather than west toward Everett, which is currently a major destination for commuters of Snohomish County. The potential effects of this destination change are taken into account in the design and modeling of proposed US 2/SR 204/20th Street SE interchange improvements. See the Methods and Assumptions document, Appendix A, for discussion of the travel demand model inputs.

City of Monroe

The City of Monroe Comprehensive Plan “represents the primary framework for policy formulation and decision making over time.”²² It is created based on significant input from the community and directs the city's zoning and development regulations to achieve goals based on interaction from the community.

The City of Monroe Land Use Chapter articulates the goals of maintaining their geographic footprint while continuing to grow as a resource for smaller communities in the area and for travelers along US 2. Their retail growth along US 2 provides a significant source of employment for the community, and residents and visitors are heavily dependent on US 2 and SR 522 for regional mobility.

As the population of Monroe is served by US 2 as their primary conduit into and out of Everett, and to I-5 NB, any improvements to the US 2/SR 204/20th Street SE interchange will be consistent with their goal to improve mobility along US 2.

5.3 STATE TRANSPORTATION PLANS

5.3.1 Washington Transportation Plan 2007–2026

The Washington Transportation Plan (WTP) was established in 2006 to outline transportation goals and objectives for the State of Washington, laying forth policy guidance for transportation system development for the next 20 years. It describes transportation system improvement categories and identifies priority improvement projects within each category. An update to the WTP is currently in progress, with a draft available for public comment.

The WTP 2035 is a currently-in-effect policy update to the WTP; this illuminates a vision for an improved multimodal transportation network over the next 20 years.

The Washington Highway System Plan (HSP) is an element of the WTP that outlines current and long-range needs in the state highway system, based on policy established in the WTP. Specific issues, needs, correctional strategies, and performance measures are identified in each of the improvement categories outlined in the WTP.

The improvements to the US 2/SR 204/20th Street SE interchange are consistent with the goals set in the WTP and HSP, specifically addressing mobility and safety improvements for overall efficiency of the regional multimodal network.

5.3.2 WSDOT Highway System Plan

The Washington statewide 2007-2026 HSP is the comprehensive network plan for the state highway system. It addresses existing and future highway needs according to the transportation policy goals, which are established in RCW 47.04.280 and used as the framework for statewide network analysis and planning. These policy goals include the following:

- Economic vitality – Supporting the movement of people and goods to benefit the economy.
- Preservation – Preserving prior transportation infrastructure investments.
- Safety – Improving the safety of the transportation system for all users.
- Mobility – Congestion relief and reliable freight transportation.
- Environment – Protecting and improving the communities and environment.
- Stewardship – Responsible planning and management of resources dedicated to the transportation infrastructure.

The HSP is organized into two sections to address the policy goals of preservation and improvement. The alterations under consideration for the US 2/SR 204/20th Street SE interchange can best be classified as improvements addressing Highway Safety and Mobility concerns. The US 2 corridor is highlighted as an area that will operate less than efficiently in the analysis year 2030.

The proposed improvements are targeted toward reducing and preventing collisions and improving mobility along the US 2 corridor.

5.4 REGIONAL TRANSPORTATION PLANS

5.4.1 PSRC Transportation 2040 Plan/2014 Update

Transportation 2040 is the long-range, multimodal transportation plan for the central Puget Sound region. It lays out a balanced set of investments and strategies to accommodate growth and meet the region's transportation needs for the next 30 years. The plan includes investments in bike and pedestrian facilities, local and regional transit, auto and passenger ferries, city and county roads, and state highways. Adopted in 2010, Transportation 2040 is built upon the foundation of VISION 2040, including the regional growth strategy and multi-county planning policies. Transportation 2040 will reduce congestion and improve mobility for people and freight within a balanced financial strategy and while protecting the region's environment. The plan's investments are focused on maintaining and preserving the existing system, enhancing safety and security, improving efficiency, and prioritizing investments in strategic capacity. Transportation 2040 meets state and federal planning requirements, including the mandate for plan updates every four years and achieving air quality conformity.²³

The PSRC Transportation 2040 identifies planned investments throughout the Puget Sound Region, both programmed and unprogrammed. An appendix of the Transportation 2040, the Regional Capacity Project List (RCPL) includes proposed improvements of regional significance from any funding source. Several candidate projects are listed in the RCPL which are of planning significance to the US 2/SR 204/20th Street SE interchange:

- Community Transit core or BRT service

ID 5742: US 2 corridor (Everett to Monroe)	Unprogrammed
ID 5478: 20th Street SE (US 2 to SR 9)	Unprogrammed
- WSDOT

ID 5433: US 2/SR 9 interchange reconstruction	Candidate
ID 4175: US 2 widening (SR 204 to Bickford)	Candidate
ID 4412: US 2 trestle widening – Stage 1	Candidate
ID 5324: US 2 trestle widening – Stage 2	Unprogrammed

The US 2/SR 9 interchange reconstruction is discussed further in Policy Point 6. US 2 widening candidate projects, if advanced, would necessitate some adjustment to the current US 2/SR 204/20th Street SE interchange. The two stages of the trestle widening project allow for preliminary construction of the US 2/SR 204/20th Street SE interchange and the structure over Ebey Island during the first stage of work. The second stage would construct the new trestle structure to include a third lane designated for HOV traffic. The interchange improvements would be consistent with the proposed widening and HOV/BRT improvements outlined above.

5.4.2 2017–2020 Regional Transportation Improvement Program (TIP)

The Regional TIP provides a list of current transportation projects in all four counties of the region – King, Kitsap, Pierce, and Snohomish. These projects are funded with federal, state, and local funds, including the most recent federal grants awarded through PSRC as part of the 2016 project selection process. The TIP is required under federal and state legislation, and helps to ensure that transportation projects in the region are meeting regional policies and federal and state requirements such as those under the Clean Air Act. The Regional TIP must contain all projects utilizing federal transportation funds, as well as any regionally significant projects in the region, regardless of funding source.²⁴

Improvements to the intersection of US 2/SR 204 are not included in the Regional TIP. As the location and improvements are of regional significance, the project can be added to the TIP by amendment, but must first be identified on the Transportation 2040 RCPL. Instructions for submitting a request for addition of a project to the RCPL are available on the PSRC website. Improvements to the US 2/SR 204/20th Street SE interchange would be consistent with the current candidates on the RCPL to widen the US 2 trestle, from SR 204 to Bickford Avenue and from Bickford Avenue to Monroe Avenue.

5.4.3 US 2: Everett Port/Naval Station to SR 9 Corridor Planning Study

This WSDOT planning study, completed in August 2016, evaluated the operations of US 2 along a 5-mile segment from I-5 to SR 9, and along SR 529 from I-5 to the Port of Everett.

Key findings include:

- Safety:
31 percent of all collisions within the US 2 influence area studied occurred at the US 2/SR 204/20th Street SE interchange area, including two of six serious injury collisions.
- Population:
40 percent of all jobs within the county are in Everett.
The population of Lake Stevens had increased 400 percent from 2000 to 2010.
- Travel demand:
Of trips crossing the US 2 trestle westbound, 59 percent were estimated to enter the highway at the US 2/SR 204/20th Street SE interchange.

Improvements evaluated in the study focused primarily on alternatives to alleviate congestion and improve safety at the US 2/SR 204/20th Street SE interchange. Alternatives considered include a bypass of the interchange, ramp metering, road widening, and implementation of intelligent transportation systems.

The US 2 Corridor Planning Study identified the US 2/SR 204/20th Street SE interchange as a primary point of operational concern along the US 2 corridor, due to its unique travel demand – the through travelers along US 2 are outnumbered by those accessing the highway at that point, which leads to a large number of collisions in the existing roadway configuration. The proposed interchange improvements discussed in

this IJR take into consideration and seek to resolve to the greatest extent possible the issues identified in the US 2 Corridor Planning Study.

In addition, the US 2 CPS also recommended planning for the long-term replacement of the WB US 2 trestle.

5.4.4 Snohomish County Comprehensive Plan Transportation Element

The Snohomish County Transportation Element, effective July 2015, is a long-term plan for specific transportation projects to support the county's future land use needs. It inventories county transportation facilities and specifies LOS criteria, summarizes projected growth throughout the county, and identifies shortfalls in the transportation system. The Transportation Element sets forth a strategy to maintain concurrency of the transportation and land use needs in accordance with the GMA.

The Transportation Element is supplemented by the Transportation Needs Report (TNR), which lists project needs identified; and the Transportation Improvement Plan (TIP), a six-year plan for improvements.

The Snohomish County Transportation Element identifies the 20th Street SE corridor and US 2 from SR 204 to Everett as a core transit emphasis corridor. Improvements to the segment from US 2 to Cavalero Road are listed in the TNR as an inactive project, annexed by Lake Stevens in 2009.

5.4.5 Sound Transit

The Sound Transit 3 long range plan, approved November 2016, assesses regional public transportation needs based on projected population and employment growth throughout the PSRC jurisdiction. Existing Sound Transit does not currently extend east of Everett; there are no Sound Transit routes that travel along US 2 or to eastern Snohomish County. There are no planned services in this area or along US 2; the US 2/SR 204/20th Street SE interchange improvements being proposed would have no impact on Sound Transit service.

5.4.6 Community Transit

The Community Transit Long Range Plan, adopted in March 2011, is a 20-year system plan based on expected growth throughout Snohomish County. The plan identifies community, commuter and arterial routes that will use US 2 to connect the cities of Lake Stevens, Monroe and Snohomish to a BRT hub near I-5 and US 2. The arterial service proposed from Lake Stevens will access US 2 via 20th Street SE.

Proposed improvements to the study interchange would facilitate transit mobility through the interchange for routes along US 2 as well as those accessing the highway from 20th Street SE.

5.5 LOCAL TRANSPORTATION PLANS

5.5.1 2015–2035 City of Lake Stevens Comprehensive Plan Transportation Element

The City of Lake Stevens Transportation Element classifies all roads within or adjoining the City of Lake Stevens boundaries. It specifies the criteria for determination of whether the transportation infrastructure meets the minimum acceptable performance standards, both today and in the future based on projected growth demands outlined in the Lake Stevens Comprehensive Plan. The six-year TIP is associated with the Transportation Element, and maintains a list of priority projects – both funded and unfunded – that are currently identified to meet existing and future needs.

The US 2/SR 204 improvements are not listed in the TIP, as US 2 is outside the jurisdiction of the City of Lake Stevens for improvement. However, the recommended interchange improvements are consistent with the City of Lake Stevens Transportation Element goals of maintaining the existing transportation system in a safe and usable state, and “emphasizing access, direct circulation and safety for [all transportation modes] locally and to the region.”²⁵

5.5.2 Everett Comprehensive Plan Transportation Element

The Everett Comprehensive Plan Transportation Element coordinates all transportation-related and affected plans within the City of Everett to provide a guide for investments in the city’s transportation improvement projects. This identifies the types of projects needed to support future demand, which are then summarized in the city’s TIP.

Congestion at the I 5/US 2 interchange can affect the traffic patterns along US 2 up to and beyond the US 2/SR 204/20th Street SE interchange. In accordance with the Everett Comprehensive Plan, the improvements at US 2/SR 204 will take into consideration effects at the I 5/US 2 interchange and will be designed to improve safety for all travelers. Incorporation of HOV lanes along US 2 from I-5 to 20th Street in Lake Stevens are listed in the Comprehensive Plan Transportation Element and TIP as planned improvements, and along I-5 from US 2 to Marysville. Improvements to the US 2/SR 204/20th Street SE interchange will be consistent with this intention to extend HOV lanes from Lake Stevens to Everett.

5.5.3 City of Snohomish Transportation Master Plan

The City of Snohomish Transportation Master Plan is an analysis of the current and future needs of the transportation system within the City of Snohomish. It evaluates existing transportation infrastructure, “establishes standards for levels of service, and identify existing and future deficiencies based on land use growth projections.”²⁶ The Transportation Master Plan supports the Comprehensive Plan and is guided by the goals established in the Transportation Element.

Improvements to the US 2/SR 204/20th Street SE interchange will be consistent with the City of Snohomish Transportation Master Plan by alleviating any congestion that may be caused along US 2 east of the study interchange, which could in turn cause congestion within the Snohomish City boundaries. Any effect within the City of Snohomish will be an increase in level of service of the existing infrastructure.

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- ¹⁷ VISION 2040 Website <http://www.psrc.org/assets/1776/V2040poster.pdf>
- ¹⁸ VISION 2040 Executive Summary <http://www.psrc.org/assets/1775/V2040execsumm.pdf>
- ¹⁹ VISION 2040 - Transportation
- ²⁰ VISION 2040 Website <http://www.psrc.org/assets/1776/V2040poster.pdf>²¹ City of Lake Stevens Land Use Element
- ²² City of Monroe Comprehensive Plan – Chapter 2
- ²³ Transportation 2040 Update – Chapter 1
- ²⁴ 2017-2020 Regional Transportation Improvement Program
- ²⁵ City of Lake Stevens Comprehensive Plan – Transportation Element
- ²⁶ City of Snohomish Transportation Master Plan – Introduction

POLICY POINT 6. FUTURE INTERCHANGES

Is the proposed access point revision compatible with a comprehensive network plan? Is the proposal compatible with other known new access points and known revisions to existing points?

In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).

6.1 SUMMARY

Comprehensive network plans include the WSDOT HSP and PSRC Transportation 2040, both of which are founded on policy goals established by state legislature in RCW 47.04.280 to maintain and preserve a safe and efficient transportation network. Additional transportation plans and their relevance to this interchange project are discussed further in Policy Point 5.

Proposed improvements to the US 2/SR 204/20th Street SE interchange are targeted at addressing the safety and transportation/mobility efficiency needs identified in the Regional Transportation 2040, shortfalls identified in the US 2 Corridor Planning Study, and include improvements partially suggested in the Regional Capacity Projects list (realignment of the WB SR 204 to WB US 2 on-ramp and improving weaving conditions for the interchange – project 4412).

There are several improvement project candidates that will immediately impact the US 2/SR 204/20th Street SE interchange; the proposed interchange improvements considered in this IJR are compatible with and complimentary to the adjacent corridor improvements.

There is one access point revision currently identified in the Regional Capacity Projects – reconstruction of the existing US 2/SR 9 interchange. Final improvements to either interchange will have no interference with the other interchange due to the distance between them along US 2.

All local transportation network plans were reviewed, including those for Snohomish County and the cities of Lake Stevens, Snohomish, Marysville, Monroe, and Everett. No additional access points have been proposed within the study area.

A comprehensive list of local and regional transportation projects is included in the Methods and Assumptions Memo, Appendix A. Coordination of local projects as well as those mentioned above are discussed in Policy Point 7.

6.2 COMPREHENSIVE NETWORK PLANS

6.2.1 WSDOT Highway System Plan

The Washington statewide 2007–2026 HSP is the comprehensive network plan for the state highway system. The plan has been reviewed for scheduled interchange improvements; the closest in proximity to the US 2/SR 204/20th Street SE interchange is the US 2 Monroe Bypass, which is well out of the area of concern for coordination.

6.2.2 PSRC TRANSPORTATION 2040

The Transportation 2040 is the multimodal regional network plan for the Puget Sound Region. The Puget Sound region is comprised of King, Pierce, Snohomish, and Kitsap counties. The plan focuses on three main objectives:

- Maintenance, preservation, and operation of a safe network
- Supporting the VISION 2040 growth strategy with efficiency improvements
- Greater options and regional mobility through strategic capacity

The TRANSPORTATION 2040 is supported by a list of Regional Capacity Projects, which includes several projects in the vicinity of the US 2/SR 204/20th Street SE interchange. Key project candidates include US 2 trestle widening, US 2 widening (SR 204 to Monroe Ave), and reconstruction of the SR 9/US 2 interchange.

Realignment of the SR 204 to US 2 WB on-ramp is included in the US 2 trestle widening candidate project. The proposed improvements to the US 2/SR 204/20th Street SE interchange are compatible with and complimentary to any widening projects along US 2; if the widening projects are funded, the proposed road configurations will be integral to the US 2/SR 204/20th Street SE interchange design. Potential reconstruction of the SR 9/US 2 interchange is discussed further in this chapter.

6.2.3 US 2: Everett Port/Naval Station to SR 9 Corridor Planning Study

The US 2 Corridor Planning Study evaluated the operations of US 2, focusing on a segment of US 2 and extension via SR 529 to the Port of Everett. The segment of US 2 evaluated in the US 2 Corridor planning study encompasses the portion of US 2 that has been analyzed in conjunction with this IJR.

The US 2 Corridor Planning Study did not recommend any additional access points within the study area. The improvements recommended by the study included significant alteration to the US 2/SR 204/20th Street SE interchange, which this IJR evaluates further as a result of the US 2 Corridor Planning Study. Recommended alterations to the US 2/SR 204/20th Street SE interchange include the following:

- Separate lanes for SR 204, 20th Street SE, and US 2 approaching the WB US 2 trestle.
- Integrated traffic system (ITS) cameras and message signs along US 2 between I-5 and SR 204.
- A transportation demand management program and dedicated incident response team for WB and EB US 2 between I-5 and SR 204.

The US 2 Corridor Planning Study also recommends reconstruction of the WB US 2 to northbound I-5 on-ramp, which would not interfere with the US 2/SR 204 access point due to the distance of over 2 miles between the two access points along US 2.

6.3 PROPOSED ACCESS POINT REVISIONS

6.3.1 Revision: SR 9/US 2 Interchange

Several candidates in the PSRC Regional Capacity Projects, and some completed projects, seek to widen SR 9 from SR 92 north of the City of Lake Stevens, south past the US 2/SR 9 interchange and through the City of Snohomish. Incidental to this widening and the previously discussed US 2 widening is a proposal to

reconstruct the existing US 2/SR 9 interchange from its current configuration to a standard “tight diamond”. The separation between US 2 interchanges at SR 204 and SR 9 is greater than 2 miles, and improvements to either interchange should not interfere with the other as they are spaced far enough to eliminate traffic conflicts.

6.3.2 20th Street SE Widening

20th Street SE widening is listed in the City of Lake Stevens TIP (project ID 7(1,3)). Improvements include widening 20th Street SE from US 2 to 91st Avenue SE, and if pursued would require integration with the geometric design of the US 2/SR 204/20th Street SE interchange. These potential improvements are accounted for in the proposed design to allow for future development without significant adjustment to the US 2/SR 204/20th Street SE interchange.

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POLICY POINT 7. COORDINATION

Are all coordinating projects and actions programmed and funded?

When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).

7.1 SUMMARY

Proposed improvements to the US 2/SR 204/20th Street SE interchange are part of a stand-alone project that addresses existing transportation needs. The project will specifically improve mobility and safety at the intersection of SR 204, 20th Street SE, and US 2.

There are no supplementary projects that are necessary for the completion of the proposed interchange improvements, nor is there any reliance on other development or improvements in order to achieve the desired result in modeling future traffic operations and predicting safety factors.

Although the proposed improvements are not reliant on any other infrastructure alteration, there are several project candidates within the impact area that, if funded and pursued, would be complementary to and integrated with the US 2/SR 204 improvements proposed in this report.

7.2 PROGRAMMING AND FUNDING

The study interchange project is not funded beyond the initial IJR study phase. Findings from the IJR will be used by local and regional stakeholders to identify future funding opportunities to fund future environmental, design, and construction phases of the project. As the IJR study comes to a close, more information will be available regarding funding opportunities and a programming timeline could be available. If adjacent projects are funded and programmed ahead of the study interchange project, then the WSDOT will be involved to ensure a coordinate effort is established to not preclude the future interchange project.

7.3 PROSPECTIVE LOCAL TRANSPORTATION IMPROVEMENTS

As discussed in Policy Point 6, 20th Street SE improvements would require integration with the geometric design of the US 2/SR 204/20th Street SE interchange. Any future development along 20th Street SE would be under the jurisdiction of the City of Lake Stevens, who would oversee plan approval and integration with existing and proposed improvements. Final approval of the integration with the US 2/SR 204/20th Street SE interchange would reside with WSDOT. Should the improvements be approved and funded prior to completion of US 2/SR 204/20th Street SE interchange improvements, construction phasing will account for coordination between the improvements.

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POLICY POINT 8. ENVIRONMENTAL PROCESSES

What is the status of the proposal's environmental processes? This section should be something more than just a status report of the environmental process; it should be a brief summary of the environmental process.

The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

8.1 ENVIRONMENTAL OVERVIEW

This policy point highlights the required environmental process for the improvements described in this IJR. The IJR report is intended to result in a “finding of engineering and operational acceptability” and will be approved at the same time as a formal decision on the National Environmental Policy Act (NEPA) environmental document that is being prepared concurrently with the IJR.

Because the US 2/SR 204/20th Street IJR study was funded prior to a full environmental process, WSDOT performed a high-level environmental review of the study interchange and surrounding areas (Figure 1-1 Study Area) for the IJR. The information presented primarily comes from online resources and databases, and GIS. A short reconnaissance field visit was also conducted by WSDOT NW Region environmental staff. This section of the IJR provides a high-level summary of the findings while more detail can be found in the Environmental Considerations Report attached in Appendix J. The Environmental Classification Summary (ECS) shown in the memorandum was used as a tool to gather information about the various environmental considerations typical for WSDOT projects. Conservative assumptions about the project were made and a narrative was developed based on the answers in the ECS.

8.2 KNOWN ISSUES

Table 8-1 lists the environmental considerations that help to delineate the environmental process for the PPA. These are the topics from the ECS (Appendix J). Also in Table 8-1 is an estimate of the potential for budget or schedule impacts. This “weighting” is meant to help prioritize as alternatives are further considered through a final NEPA/SEPA process. For instance, impacts to migratory bird species may not be as important a consideration as impacts to endangered species. The final three alternatives were similar regarding their anticipated environmental impacts. Key differences between the final three concepts include lane configurations on an assumed future WB US 2 trestle. Because the future trestle was not considered as part of the US 2/SR 204/20th Street SE interchange justification report, rather a future condition that the interchange design would need to be integral with, the team did not rate environmental impacts associated with a three- or four-lane trestle. It is assumed that the future US 2 west trestle replacement project will consider how to avoid, minimize, and/or mitigate future environmental impacts associated with the project.

This is not a comprehensive list of environmental considerations. Rather, this is a preliminary list to be used for evaluating alternatives in a consistent, objective manner. A comprehensive environmental study will be completed after a design alternative is selected and funding is assigned.

TABLE 8-1. ENVIRONMENTAL CONSIDERATIONS FOR US 2/SR 204/20TH STREET SE IJR

Report Section	Environmental Regulation or Consideration	Potential Risk to Schedule/Budget
3.1 Environmental Classification	NEPA and SEPA Classification	High
	Endangered Species Act	High
	National Historic Preservation Act: Section 106	High
3.2.1 Federal	US Army Corps of Engineers	High
	US Coast Guard	Low
	Section 4(f)	Medium
	Section 6(f)	Medium
	Farmland Conversion	Medium
3.2.2 State	Hydraulic Project Approval	Medium
	Section 401 Water Quality Certification	Medium
	Coastal Zone Management Certification	Low
	NPDES Construction Stormwater Permit	Low
	Temporary Erosion Sediment Control Plan	Low
3.2.3 Local	Critical Areas Ordinance Compliance	Medium
	Jurisdictional Stormwater Manual	Low
	Noise Variance	Low
	Floodplain Development Permit	Medium
	Shoreline Management Program	Low
3.2.4	NA	NA
3.2.5 Other	Migratory Bird Treaty Act	Low
	Essential Fish Habitat	Low
3.3 Environmental Context	Air Quality	Low
	Wetlands/Critical Areas/Resource Lands	Medium
	Hazardous Materials	Low
	Noise	Low
	Scenic Byways and State Scenic and Recreational Highways	Low
	Title VI/Environmental Justice	Low
	Water Quality/Stormwater	Low
	Visual Quality/Roadside Policy Manual/Aesthetics	Low

8.3 STAKEHOLDER AND COMMUNITY ENGAGEMENT

Community and stakeholder engagement is a key process in the NEPA/SEPA effort to ensure that affected parties are aware of the project scope and have an opportunity to review and comment on the project. Many key stakeholders would be involved in the process and would have signatory authority for several of the permits. Key stakeholders include the US Army Corps of Engineers, Tribes, and the Department of Ecology. Because the US 2 trestle crosses over water that is home to migrating fish populations, these coordination efforts must begin early to ensure that planning and mitigation efforts are considered and well documented.

A community engagement process would also take place to help the traveling public understand the project process, impacts, mitigation, and final outcome. The public would also be able to review the environmental documents and provide comments.

Several considerations show as high or medium risk to schedule and budget of the project. This indicates that extensive coordination could be required to work through the processes and/or a high cost could exist for final mitigation of impacts to a given resource. Additional details about the environmental process will be confirmed as an interchange project is defined and funded.

8.4 ACCESS APPROVAL PROCESS OVERVIEW

Many WSDOT projects are Categorical Exclusions under NEPA and Categorical Exemptions under SEPA, and depending on the selected alternative, that may be the case for this project. If extensive changes to the existing roadway footprint are planned, further evaluation under NEPA and SEPA may be required. For NEPA, this could mean preparation of additional reports and information to comply as a Documented Categorical Exclusion. If that did not satisfy, an Environmental Assessment (EA) may need to be prepared to evaluate environmental impacts. For SEPA, an Environmental Checklist may need to be prepared. If significant impacts are determined in either case, an Environmental Impact Statement (EIS) would need to be prepared, though this is very unlikely.

Because the environmental process has not begun and the public scoping period has not taken place, the final schedule for this process has not yet been determined. Further consideration about the potential for tolling along the corridor will also be made when selecting the appropriate NEPA/SEPA process moving forward. Next steps in the environmental process require a more fully funded project that would support community engagement, full environmental analysis and documentation, and design to a level that outlines environmental impacts and methods to avoid, minimize, and/or mitigate.

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